



جامعة الملك عبد الله  
للعلوم والتقنية  
King Abdullah University of  
Science and Technology

# KAUST Library's campus wide ePoster Management Service

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Enabling Science and Innovation  
**ICSEI**  
International Council for Scientific  
and Technical Information

# THE DIGITAL TRANSFORMATION in poster sessions



## Deep Learning for High Dynamic Range Imaging

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### Background: HDR Photography

The goal of HDR imaging is to have a greater dynamic range between the darkest and lightest areas of an image. HDR images can represent more precisely real scenes intensity levels.

Many, there are three common techniques for HDR photography: (i) sequentially capturing and fusing multiple exposures images (e.g. [1], [2]). While this method is easily supported by existing cameras, additional exposure and motion stabilization techniques are usually needed. (ii) Simultaneously utilizing multiple sensors to capture different exposures (e.g. [3]). This sophisticated approach is more expensive and need rigorous calibration. (iii) Capturing single coded exposure image, along with a proper algorithm for HDR image reconstruction ([4], [5], and [6]).

### Contribution

In this project, we propose using deep learning to reconstruct HDR image from single shot coded pixel exposure computational cameras. We used deep networks for coded mask calibration, and HDR image reconstruction. Our method supports joint design of optical elements and learning algorithms. Critically, the obtained deep networks weights can be used for quick and simple coded mask calibration and a well HDR reconstruction of images greatly differing from the training set.

### Image Model

$y = f(x, \lambda, \mu)$ , where:

- $y$  is the coded LDR image
- $f$  is the Camera response function
- $x$  is the coded scene
- $\lambda$  is the point spread function
- $\mu$  is the relative radiance

### Method

- Given  $x_1, x_2, \dots, x_n$  captured with the same camera learn the Mask  $\mu$  via deep convolutional neural network.
- Given the learned mask  $\mu$  and  $y_n$ , learn the relative radiance  $\lambda_n$  by using convolutional neural-network structure introduced in [7].

### Experiments

- The set of HDR images used for training are gathered from the following online datasets (DRL-HDR, P. Arathic, Furb-HDR, Stanford, Liu-HDR, Redden, eSR, Arthro).
- 900 HDR images used for training and 164 for testing.
- For training we used online augmentation (rotation, flipping, and color augmentation).
- Mask: Random uniform 8 exposure masks are used, with  $\mu_{min} = 0.1$

### Results

### References

[1] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

[2] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

[3] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

[4] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

[5] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

[6] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

[7] M. D. Burai, S. M. Khan, and M. S. Khan, "A deep learning based approach for HDR image reconstruction from single shot coded exposure images," in *Proceedings of the IEEE International Conference on Computer-Aided Design and Computer Graphics*, pp. 1-6, 2016.

**P02** 

Current

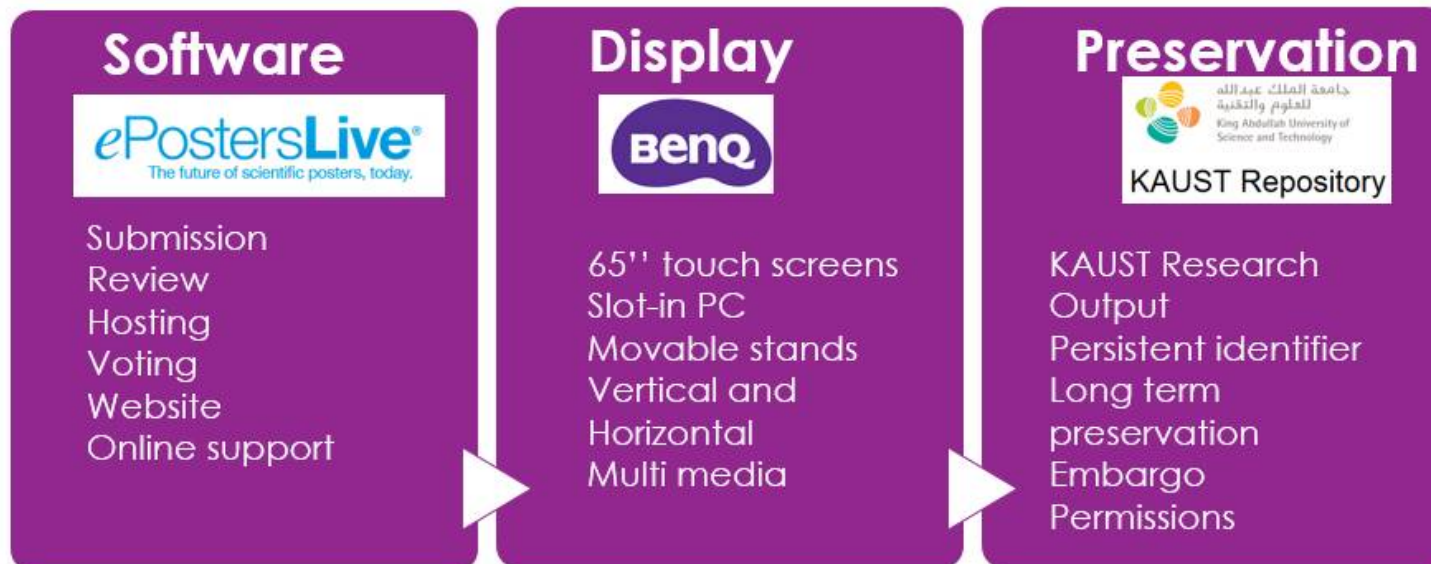


KAUST University Library ePoster Service

## The start of the project

- The idea was fully supported by University Leadership and other stake holders
- Selected Post Docs and Students were involved from the beginning
- Have trialed three poster systems including the one chosen

architecture



Touch screen 65" Model: RP653K 450nits, 3840x2160 UHD,  
BenQ unique ID, IR 10 points touch, 20W\*2 built-in SPK,  
EZWrite4.0Ltie APP, Android 5.0 embedded

PC: OPS PC i7, 8GB, 500GB (4K Graphics Card)

Display stand: Custom floor stands with landscape & Portrait  
orientation

ePosterslive contract charge for 10 events

Enhanced video/audio availability option

Additional equipment (cables, router, backup laptops, spare slot-  
in PC)

Identified customization (automated repository upload, local  
KAUST server implementation, synchronization, knowledge  
transfer and training)

KAUST University Library ePoster Service

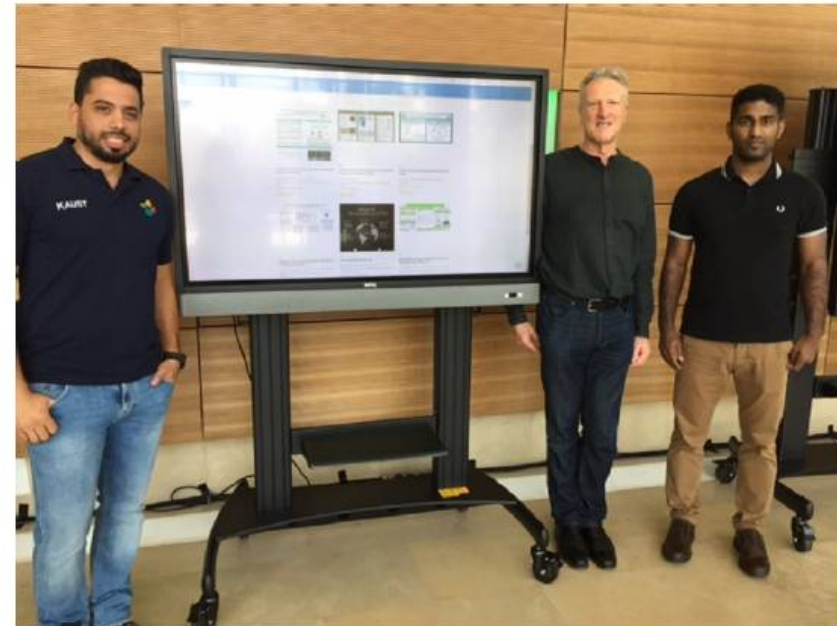
**Library initiative to  
build Digital  
Infrastructure  
to promote Open  
Access and Digital  
Preservation**

## Library e-poster as service

- Access to the system (uploading capabilities)
- Online support through the Vendor and Library
- Hardware and connectivity support from IT (AV)
- Provision of display screens
- Library space for sessions
- Digital preservation to KAUST Research Repository
- Training on e-poster creation (forth coming with Skills Lab)

## THE DIGITAL Advantage

- Ahead of the trend – digital campus
- No Printing required – Go Green
- Author can update anytime
- Zooming and touch screen functions
- Audio and video capabilities
- Animations and Simulations
- Posters available via Website
- Compatible with multiple devices
- Digital Preservation to Research Repository
- Online and offline voting capabilities
- Statistics and reporting



The enhanced capabilities of ePosters include functions that significantly improve user experience such as: zooming, higher definition imaging and the incorporation of audio and video displays. As one student explained, "...the links to plots and animations in the poster is great for display you want to show. Also the ability to zoom in on detail

**David Keyes**, Extreme Computing Research Center Director, remarked in relation to the Intel Extreme Performance Users Group Middle East (IXPUG-ME) Conference 2018, of which he was the local organizer, "We are thrilled with the opportunity to use the ePoster system." He went on to explain that "The technology is one thing. The web archive is perhaps even more significant for the mainly young or remote authors at our meeting. Posters are not 'second place' entries here. One could even argue that they have a better archival life and better production value than the talks."

## Conclusion

ePoster presentations engage the audience better; they are more interactive, dynamic and informative as a result of incorporating high resolution images and videos (with associated zoom capabilities) and audio. In addition, the elimination of print and poster mounting aligns with KAUST commitment to environmental stewardship and open access to scientific output through a direct upload of content to the Research Repository. Interest in ePosters is expanding; this has seen the Library involved in associated skills training and outreach.

Academia is notably behind this practitioner-driven trend. KAUST Library believes that, by rolling out an ePoster system to the University, it is the first campus in the world to offer this as a campus-wide solution, truly reflecting a digital smart campus vision of KAUST



*where inspiration is born*

University  
Library

Thank you



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