

A Deep-Learning Based Advert Creation System

¹Conran C., ¹Dev S., ¹Hossari M., ¹McCabe K., ¹McKibben D.,
¹Nautiyal A., ¹Nicholson M., ¹Pitié F., ²Tang J., ¹Vreeke J., and ²Xu W.

¹The ADAPT SFI Research Centre
²Huawei Ireland Research Centre

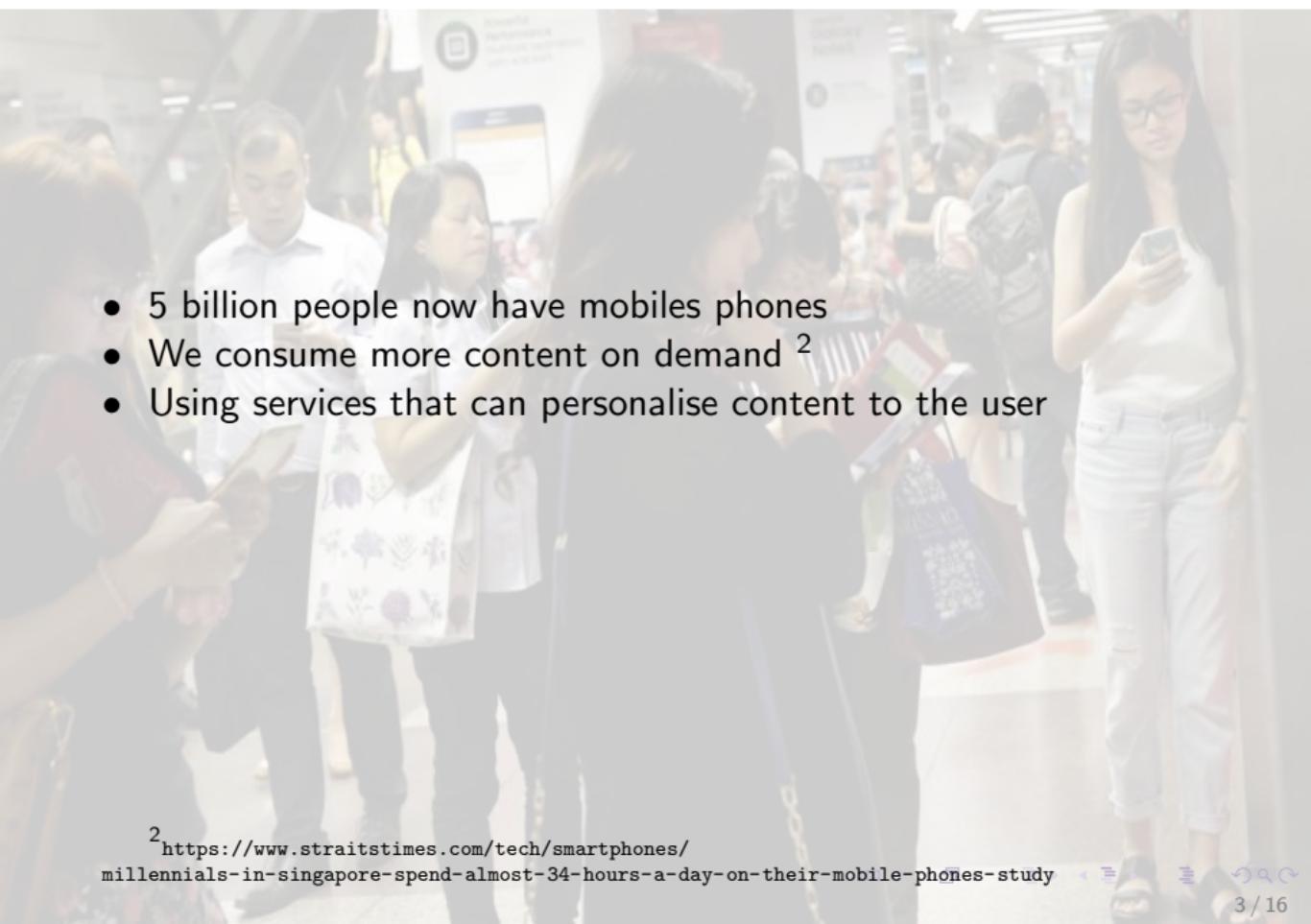
Machine Learning Dublin Meetup
June 24, 2019



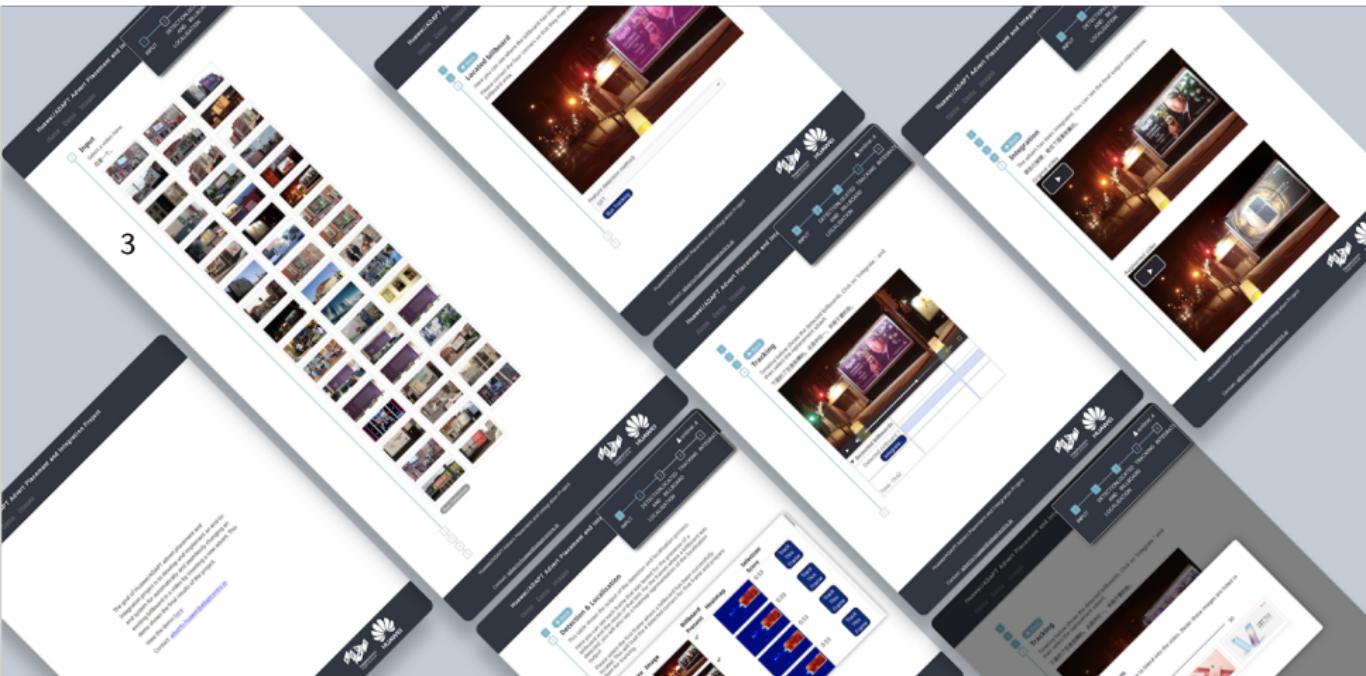


People have an insatiable appetite for media¹.

¹ <http://republicofweb.org/weblog/?p=1032>

- 
- 5 billion people now have mobile phones
 - We consume more content on demand ²
 - Using services that can personalise content to the user

² <https://www.straitstimes.com/tech/smartphones/millennials-in-singapore-spend-almost-34-hours-a-day-on-their-mobile-phones-study>



3

Illustration by M. Nicholson, October 2018.

More details on the advert creation system: <https://arxiv.org/pdf/1808.00163.pdf>

The ALOS Dataset

- ▶ We propose and release the first large-scale dataset of billboard images, along with high quality annotations of billboard location,
- ▶ We refer as the **ALOS** dataset ⁴, that stands for **A**dvert **L**ocalization in **O**utdoor **S**cenes.



⁴ S. Dev, M. Hossari, M. Nicholson, K. McCabe, A. Nautiyal, C. Conran, J. Tang, W. Xu, and F. Pitié, The ALOS Dataset for Advert Localization in Outdoor Scenes, Proc. Eleventh International Conference on Quality of Multimedia Experience (QoMEX), 2019.

The CASE Dataset

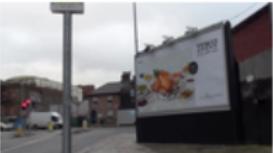
- ▶ We propose and release the first large scale dataset of candidate placements in outdoor scene image,
- ▶ We refer as the **CASE** dataset⁵, that stands for **CA**ndidate **S**paces for adv**E**rt implantation dataset.



⁵ S. Dev, M. Hossari, M. Nicholson, K. McCabe, A. Nautiyal, C. Conran, J. Tang, W. Xu, and F. Pitié, The CASE Dataset of Candidate Spaces for Advert Implantation, Proc. International Conference on Machine Vision Applications (MVA), 2019.

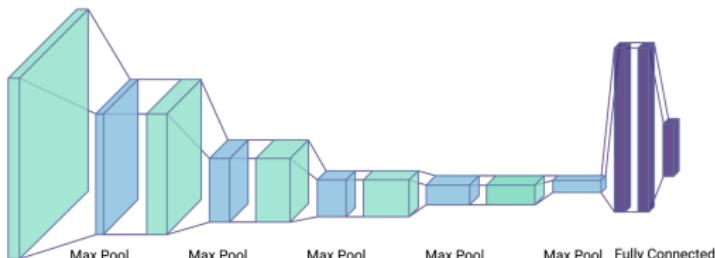
Does a video frame contain an advertisement?

- ▶ Manual identification of adverts in a video is cumbersome and time-consuming.
- ▶ Diverse scene illumination and severe occlusion make such tasks challenging.

Image	Billboard Present
	✓
	✗

AdNet for detecting adverts

- ▶ We propose ADNet⁶, a VGG based network for advert detection in a frame.
- ▶ Transfer learning using pre-trained ‘ImageNet’ model and froze all layers apart from last 5 layers. Added 3 fully connected layers with a *softmax* layer as the output layer.



⁶ M. Hossari, S. Dev, M. Nicholson, K. McCabe, A. Nautiyal, C. Conran, J. Tang, W. Xu, and F. Pitié, ADNet: A Deep Network for Detecting Adverts, Proc. 26th Irish Conference on Artificial Intelligence and Cognitive Science (AICS), 2018.

Evaluation



Positive examples of adverts correctly identified by ADNet.



Negative examples of adverts correctly ignored by ADNet.

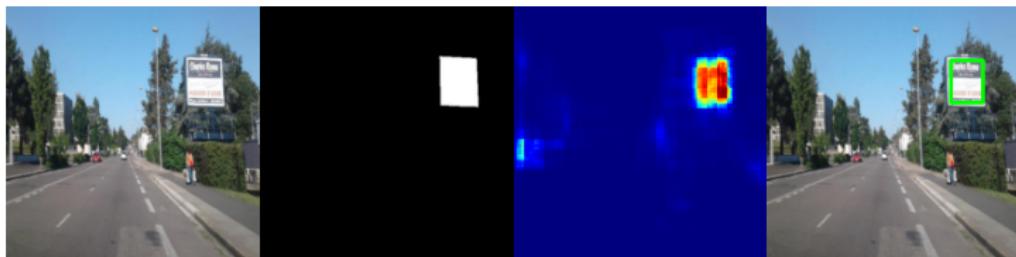
Evaluation



Examples of misclassification errors.

How to localize the position of billboard?

- ▶ Manual localization of adverts in a video is extremely time-consuming.
- ▶ No similar system exists for accurate localization of advert in a video frame.



Input Image

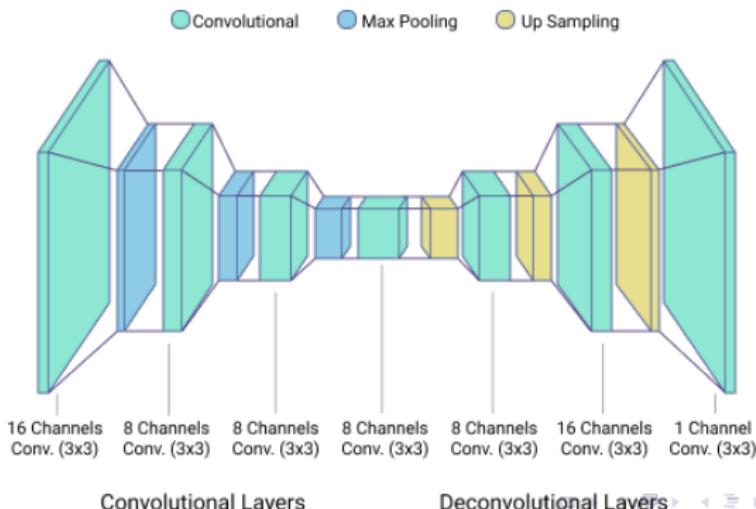
Ground Truth

Heatmap Image

Bounding Box

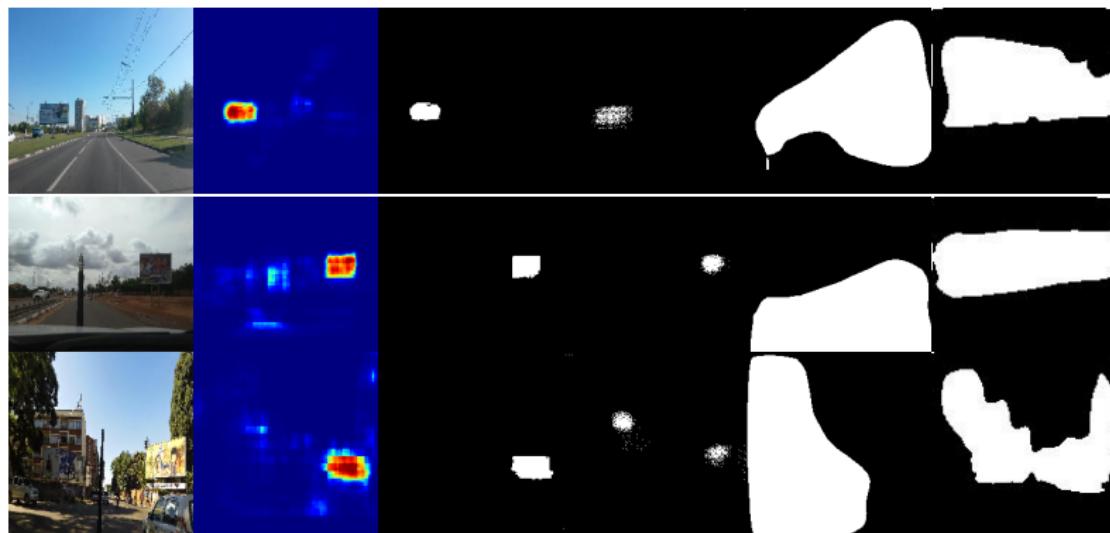
DeepAds for localizing adverts

- ▶ We propose DeepAds: a simple encoder-decoder based architecture for the purpose of billboard localization in an image.
 - ▶ It then proposes a probabilistic map illustrating the position of advert in a billboard image.



Evaluation

Our proposed approach ⁷ localizes the position of the advert accurately.



Input Image Prob. DeepAds Binary DeepAds FCN result PSPNet result U-Net result

⁷ S. Dev, M. Hossari, M. Nicholson, K. McCabe, A. Nautiyal, C. Conran, J. Tang, W. Xu, and F. Pitié, Localizing Adverts in Outdoor Scenes, Proc. IEEE International Conference on Multimedia & Expo Workshops (ICMEW), 2019.

Evaluation

We report the following metrics for objective evaluation of the different models.

- Pixel Accuracy (PA)
- Mean Accuracy (MA)
- Mean Intersection Over Union (mIOU)
- Frequency Weighted Intersection Over Union (fwIOU)

	PA	MA	mIOU	fwIOU
FCN	0.962	0.699	0.638	0.937
PSPNet	0.554	0.558	0.304	0.521
U-Net	0.721	0.814	0.432	0.689
DeepAds	0.971	0.776	0.722	0.950

How to integrate new advert in the original video?

- ▶ We use Poisson⁸ image editing to blend images keeping the structure of the target (new advert) image and color of the original (billboard) image.



⁸

P. Perez, M. Gangnet, A. Blake, "Poisson image editing", ACM Transactions on Graphics (SIGGRAPH), 2003.

The times when we are not researching on computer vision, we collect awards ⁹.



Thank You!

⁹ https://www.tcd.ie/news_events/articles/adapt-scoops-technology-ireland-award-for-disruptive-advertising-system/

https://www.tcd.ie/news_events/articles/adapt-scoops-technology-ireland-award-for-disruptive-advertising-system/