SalGAN: Visual Saliency Prediction with Adversarial Networks

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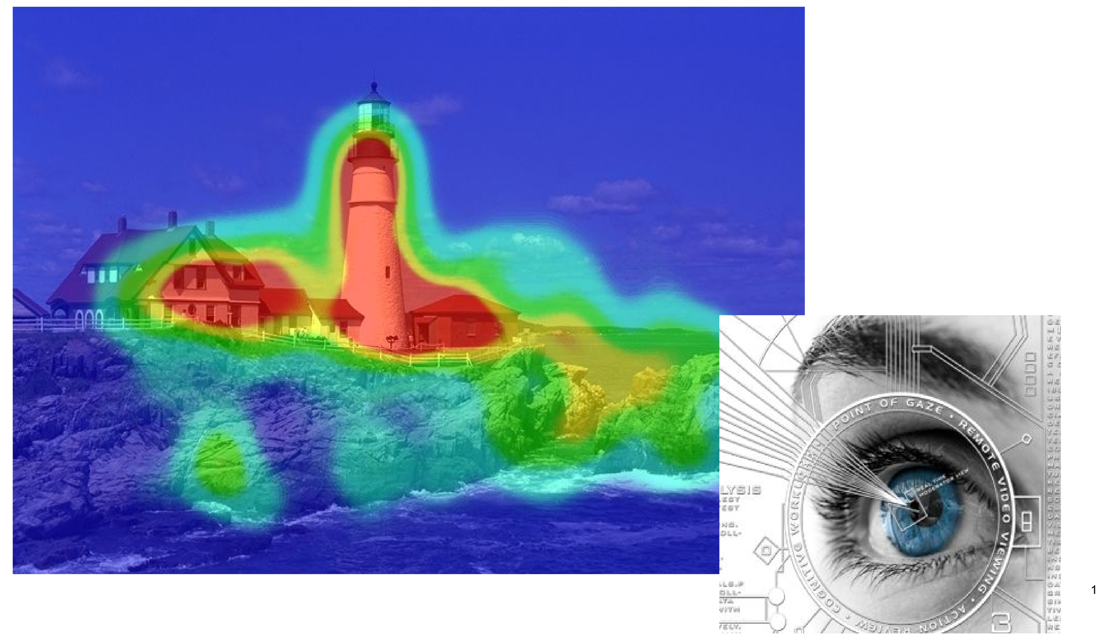
Introduction

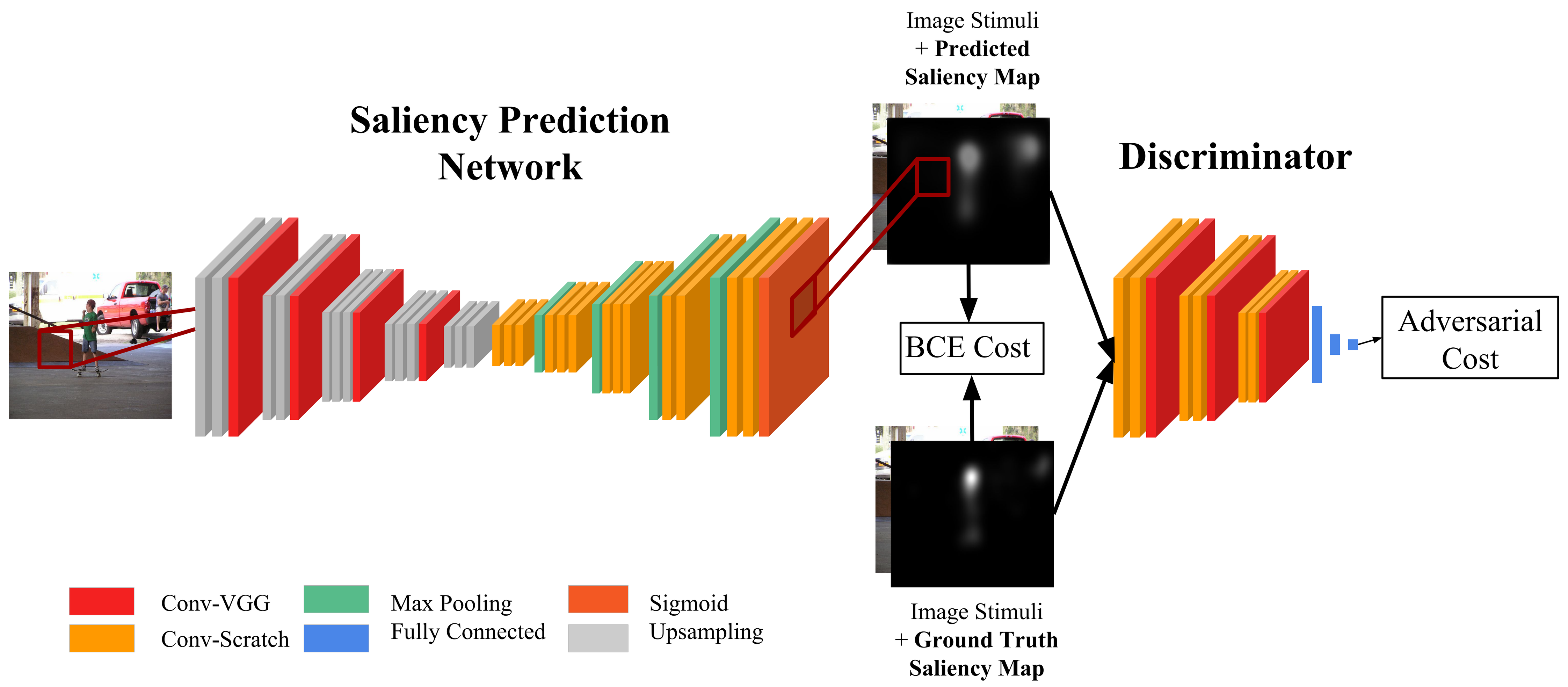


Visual saliency prediction in computer vision aims at estimating the locations in an image that attract the attention of humans.

This work explores **adversarial training** for visual saliency prediction. The discriminator distinguishes between samples from the true data distribution and samples produced by the generator.

In our case, this data distribution corresponds to pairs of real images and their corresponding visual saliency maps. We show how adversarial training significantly benefits a wide range of visual saliency metrics, without needing to specify a tailored loss function

Network Structure



Content Loss :

$$\mathcal{L}_{BCE} = -\frac{1}{N}\sum_{j=1}^{N} S_j \log(\hat{S}_j) + (1 - S_j)\log(1 - \hat{S}_j)$$

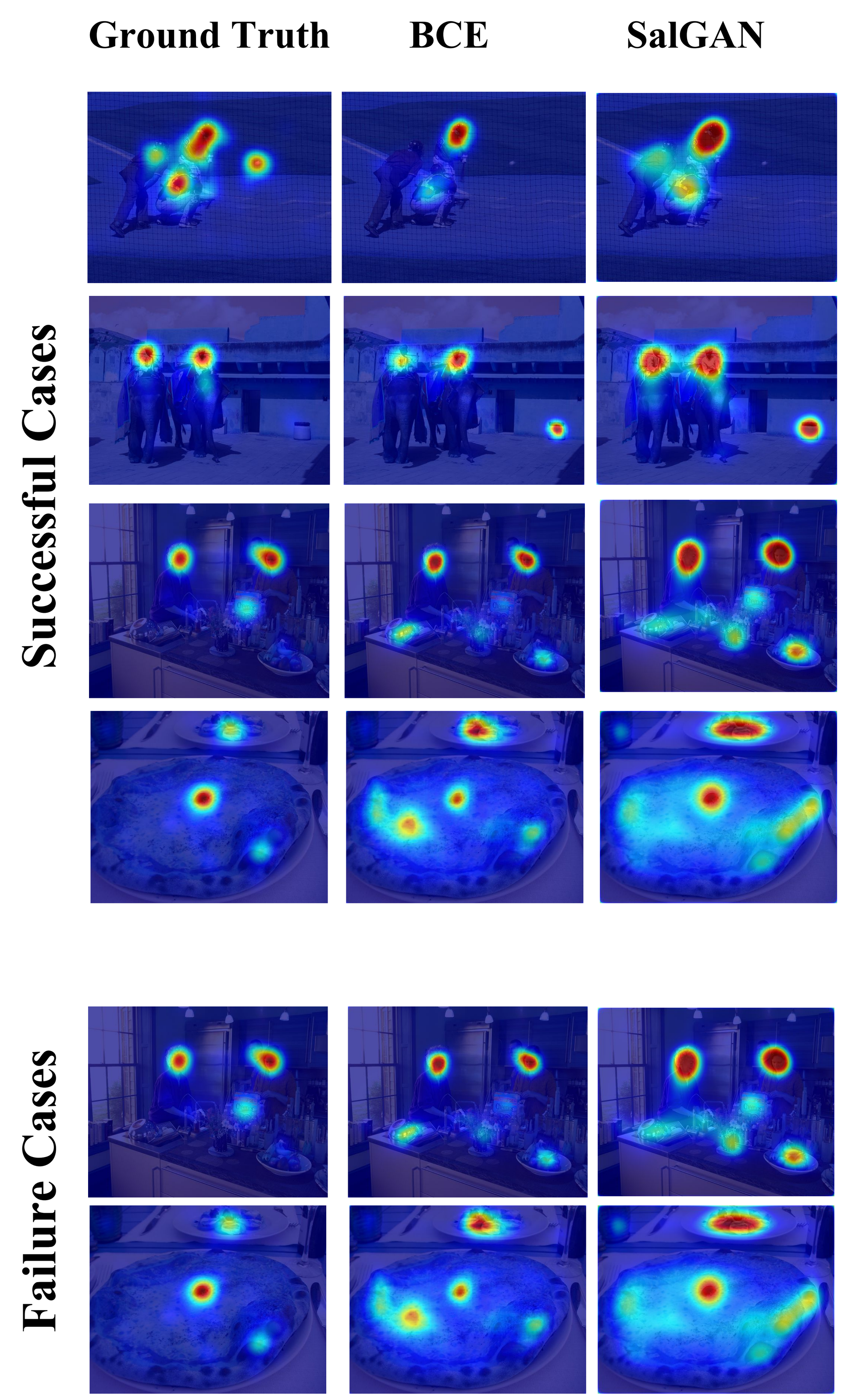
Adversarial Loss :

$$\mathcal{L}_{Adv}(I, \hat{S}) = -\sum_{n=1}^{N} \log D(I, \hat{S})$$

Training objective:

$$\mathcal{L}_{GAN} = \alpha \cdot \mathcal{L}_{BCE} - \log D(I, \hat{S})$$

Results

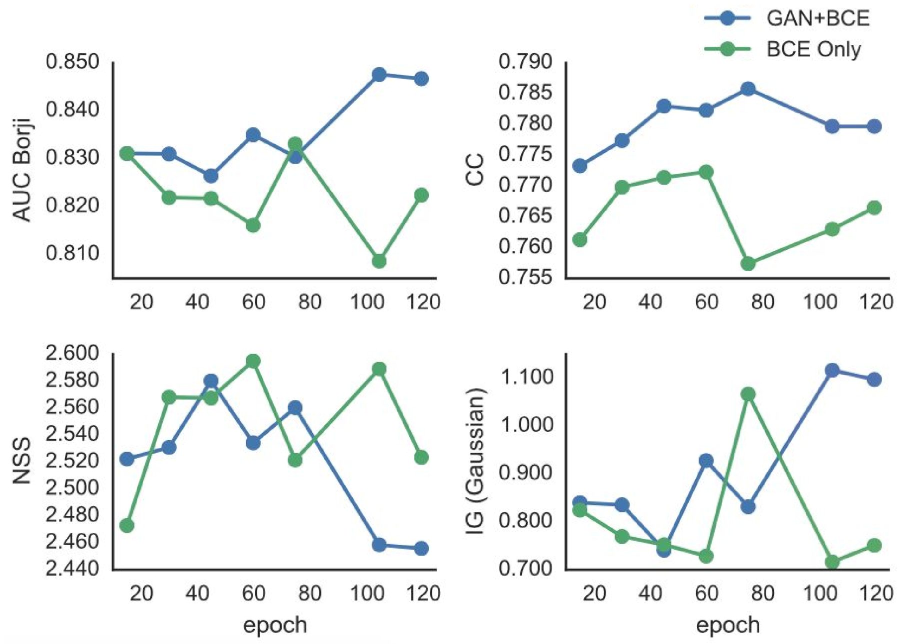


SALICON (test)	AUC-B ↑	sAUC ↑	CC ↑	NSS ↑
SalGAN	**0.884**	**0.772**	**0.781**	**2.459**
ML-NET [1]	(0.866)	(0.768)	(0.743)	2.789
SalNet [6]	(0.858)	(0.724)	(0.609)	(1.859)
MIT300	AUC-B ↑	sAUC ↑	CC ↑	NSS ↑
Humans	0.88	0.81	1.0	3.29
SALICON [3]	0.85	0.74	0.74	2.12
SalGAN	**0.81**	**0.72**	**0.73**	**2.04**

Comparison of SalGAN with other state-of-the-art solutions on the SALICON (test) and MIT300 benchmarks.

	sAUC ↑	AUC-B ↑	NSS ↑	CC ↑	IG↑
BCE	0.757	0.833	**2.580**	0.772	1.067
GAN	**0.773**	**0.859**	2.560	**0.786**	**1.243**

Results with nonadversarial (BCE) and adversarial (GAN) training. Results assessed on SALICON validation.



SALICON validation set accuracy metrics for GAN+BCE vs BCE on varying numbers of epochs.

Models & source code https://github.com/imatge-upc/saliency-salgan-2017

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