Salient object detection

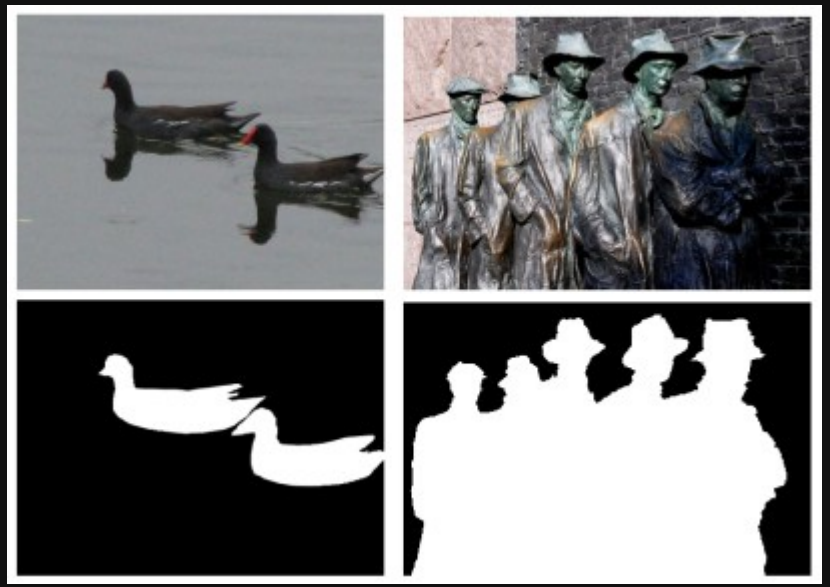
Advisor
Dr. Maryam Abedi

Student
Mohammad Shahpouri

Fall
2021

What is salient object detection?

- Salient object detection or salient object segmentation
- Detecting the most salient object
- Segmenting the accurate boundary of that object



- Gupta, A.K.; Seal, A.; Prasad, M.; Khanna, P. Salient Object Detection Techniques in Computer Vision—A Survey. Entropy 2020, 22, 1174. https://doi.org/10.3390/e22101174

Salient object detection models

- Block-based and region-based
  - Pixels
  - Blocks
  - Super-pixels
  - Regions
- Intrinsic cues
  - Edge, blob, texture, corner
- Extrinsic cues
  - Ground-truth annotations of the training images
  - Similar images
  - The video sequence
  - A set of input images containing the common salient objects
  - Depth maps
  - Light field images

Applications of Salient Object Detection

- Object detection and recognition
- Image and video compression
- Video summarization
- Photo collage/media re-targeting/cropping/thumb-nailing
- Image quality assessment
- Image segmentation
- Content-based image retrieval and image collection browsing
- Image editing and manipulating
- Visual tracking
- Object discovery
- Human-robot interaction

Datasets for salient object detection

#	Dataset	Reference	Year	Images	Objects	Annotation	Resolution	Annotators	Eye data	Image/Video
1	**MSRA-A**	[7], [232]	2007	20K	∼1	Bounding Box	400 × 300	3	-	I
2	**MSRA-B**	[7], [232]	2007	5K	∼1	Bounding Box	400 × 300	9	-	I
3	**SED1**	[139], [233]	2007	100	1	Pixel-wise	∼300 × 225	3	-	I
4	**SED2**	[139], [233]	2007	100	2	Pixel-wise	∼300 × 225	3	-	I
5	**ASD**	[7], [81]	2009	1000	∼1	Pixel-wise	400 × 300	1	-	I
6	**SOD**	[13], [234]	2010	300	∼3	Pixel-wise	481 × 321	7	-	I
7	**iCoSeg**	[131]	2010	643	∼1	Pixel-wise	∼500 × 400	1	-	I
8	**MSRA5K**	[7], [97]	2011	5K	∼1	Pixel-wise	400 × 300	1	-	I
9	**Infrared**	[235], [236]	2011	900	∼5	Pixel-wise	1024 × 768	2	15	I
10	**ImgSal**	[223]	2013	235	∼ 2	Pixel-wise	640 × 480	19	50	I
11	**CSSD**	[87]	2013	200	∼1	Pixel-wise	∼400 × 300	1	-	I
12	**ECSSD**	[87], [237]	2013	10K	∼1	Pixel-wise	∼400 × 300	1	-	I
13	**MSRA10K**	[7], [238]	2013	10K	∼1	Pixel-wise	400 × 300	1	-	I
14	**THUR15K**	[7], [238]	2013	15K	∼1	Pixel-wise	400 × 300	1	-	I
15	**DUT-OMRON**	[101]	2013	5,172	∼5	Bounding Box	400 × 400	5	5	I
16	**Bruce-A**	[6], [45]	2013	120	∼4	Pixel-wise	681 × 511	70	20	I
17	**Judd-A**	[53], [239]	2014	900	∼5	Pixel-wise	1024 × 768	2	15	I
18	**PASCAL-S**	[52]	2014	850	∼5	Pixel-wise	variable	12	8	I
19	**UCSB**	[46]	2014	700	∼5	Point-wise Clicks	405 × 405	100	8	I
20	**OSIE**	[156]	2014	700	∼5	Pixel-wise	800 × 600	1	15	I
21	**RSD**	[240]	2009	62,356	variable	Bounding Box	variable	23	-	V
22	**STC**	[241]	2011	4,870	∼1	Bounding Box	variable	1	-	V

Evaluation Measures

- Precision-recall (PR)
- F-measure
- Receiver operating characteristics (ROC) curve
- Area under ROC curve (AUC)
- Mean absolute error (MAE)

Reference

- Borji, A., Cheng, MM., Hou, Q. et al. Salient object detection: A survey. Comp. Visual Media 5, 117–150 (2019). https://doi.org/10.1007/s41095-019-0149-9

Thank you