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Supplemental Materials for 'Joint Salient Object Detection and Existence Prediction'

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1 Introduction

In this supplementary material, we first present an overview of our background dataset (Sec. 2 and Fig. 1). In Sec. 3, we provide more visualizations of our saliency features on the MSRA-B (Fig. 2), ECSSD (Fig. 3), and our background dataset (Fig. 4), respectively. Finally, in Sec. 4, we demonstrate additional qualitative comparisons of our proposed approach with state-of-the-art methods, including SF [?], GMR [?], DSR [?], RBD [?], HDCT [?], and DRFI [?], on the MSRA-B (Fig. 5), ECSSD (Fig. 6), and our background dataset (Fig. 7), respectively.

2 Overview of Background Images Dataset

According to the difficulty of recognizing the existence of salient objects, we categorize images in our background dataset as *easy, medium, and hard*. Specifically, we train a linear SVM with our global image features. Those background images that can be correctly classified using such a simple linear SVM is considered as easy ones. Since our proposed latent structural SVM (LSSVM) approach takes the regional saliency labels into account as hidden variables, better performance can be achieved. Therefore, we define medium background images as those that are incorrectly classified by a linear SVM but are correctly recognized using our LSSVM approach. If both the linear SVM and our LSSVM fail, an image is considered as hard to classify.

In Fig. 1, we demonstrate background images ranging from easy to hard. We can see that our collected background images cover both natural and abstract scenes. We will release this dataset if our paper could be accepted.

3 Visualizations of Saliency Features

As can be seen in Fig. 2 and Fig. 3, boundary connectivity and manifold ranking are two most informative features. And there are a lot of noises in other feature maps of global contrast, spatial distribution, and backgroundness. Although these features are not intentionally designed to deal with background images (thus they perform poorly on background images), our approach can produce appealing saliency maps based on them. See Fig. 4 for details.

4 Qualitative Comparisons of Salient Object Detection

In Fig. 5 and Fig. 6, we show saliency maps produced by different approaches on MSRA-B and ECSSD, respectively. We can see that in some cases, saliency maps of our proposed LSSVM approach are better than unsupervised approaches and comparable with the best supervised DRFI method, *e.g.*, the first row of Fig. 5 and second row of Fig. 6. Notice that our LSSVM approach could also generate appealing saliency maps on images with strong off-center bias (the fifth and seventh rows of Fig. 5) or touching the image border (the sixth and last third rows of Fig. 5 and the fourth row of Fig. 6).

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While conventional approaches produce inferior saliency maps on background images, our LSSVM approach can generate nearly all-black saliency maps, clearly indicating no existence of salient objects. See Fig. 7 for details.

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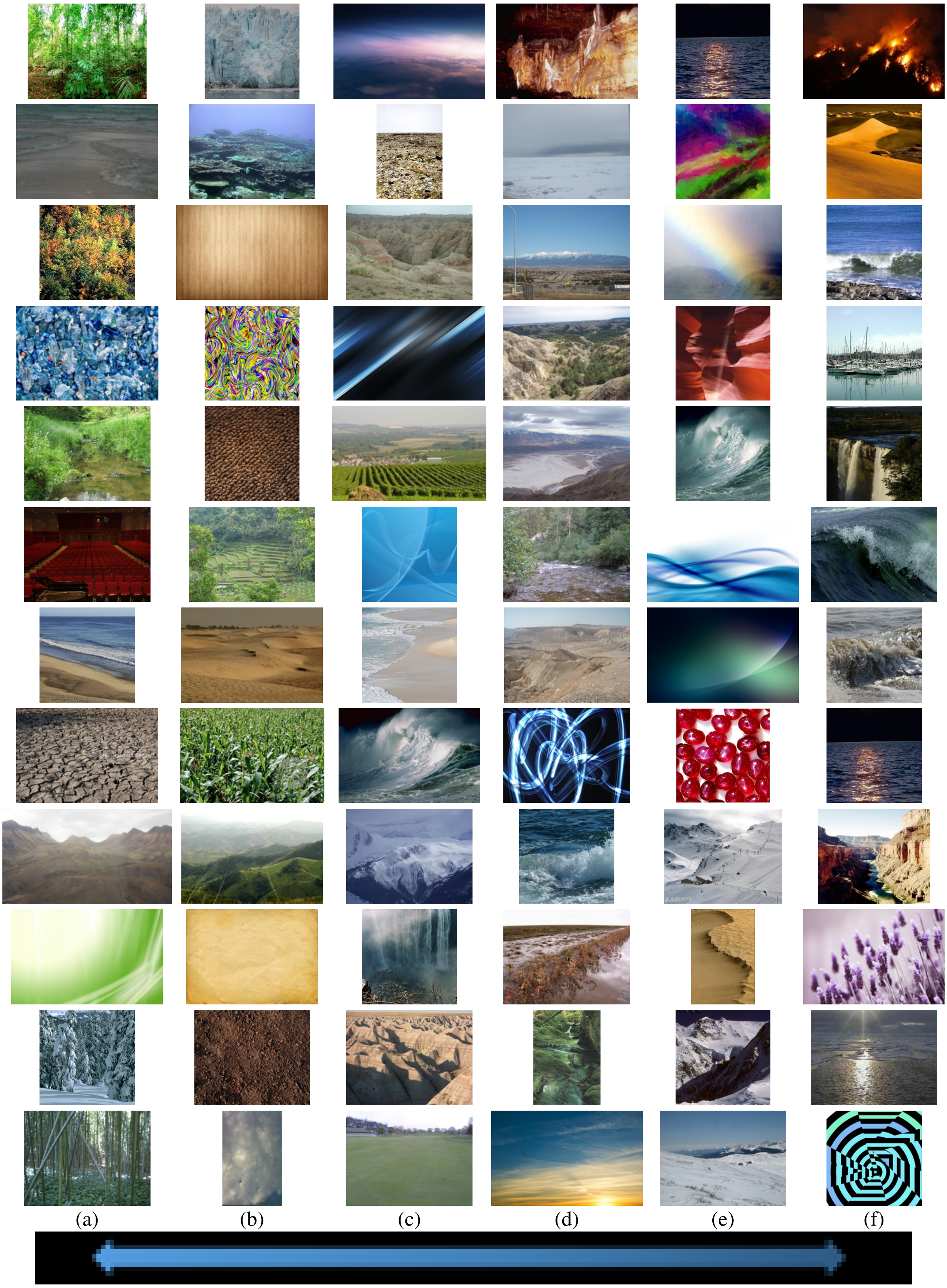
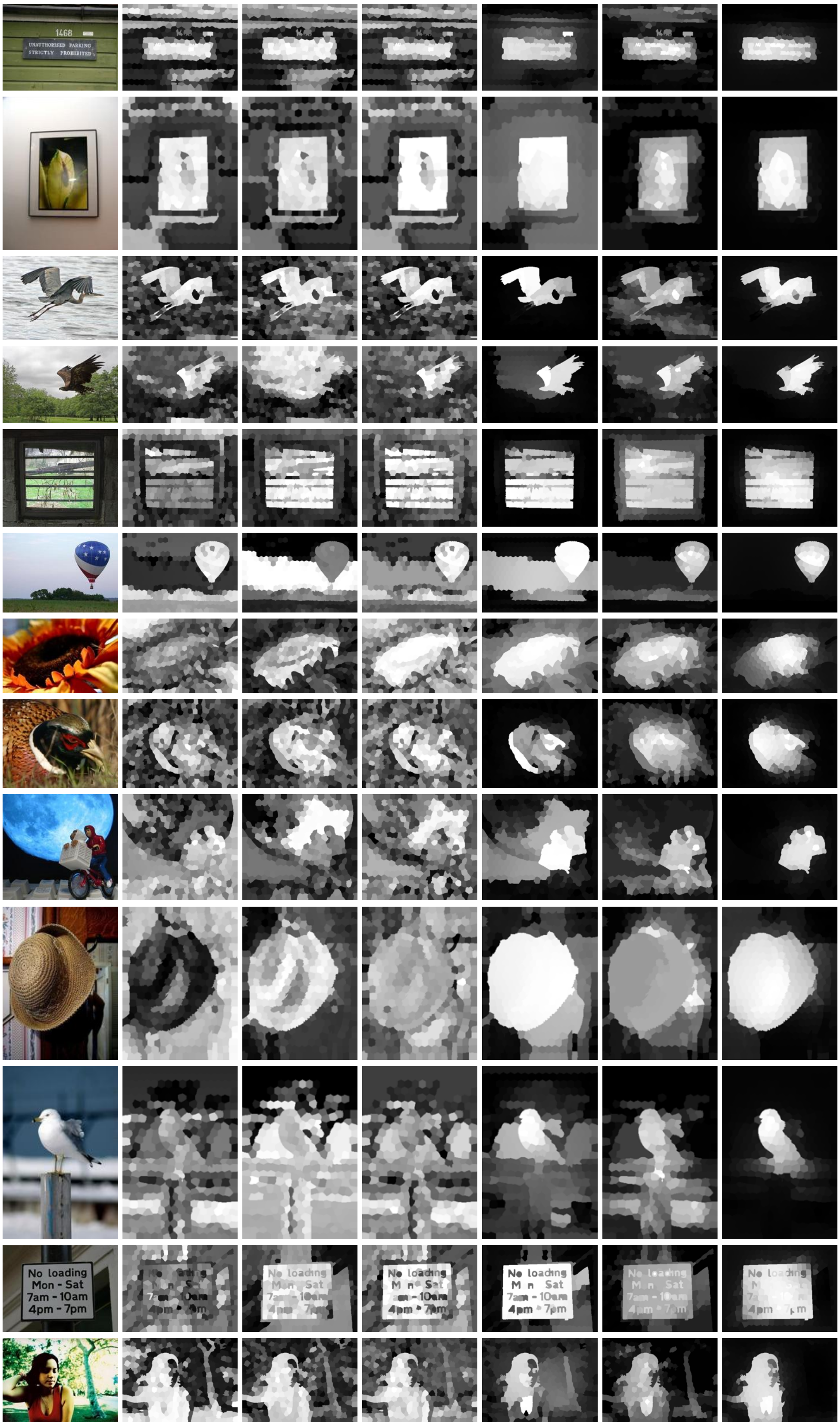


Fig. 1: Overview of our background dataset. (a)(b) images that are *easy* to identify the existence of salient objects, (c)(d) *medium* images, and (e)(f) *hard* images.



(a) (b) (c) (d) (e) (f) (g)

Fig. 2: Illustration of saliency features of randomly chosen images in the MSRA-B dataset, computed on the Lab color histogram channel. From left to right: (a) input images, (b) global contrast, (c) spatial distribution, (d) backgroundness, (e) manifold ranking, (f) boundary connectivity, and (g) final saliency maps.

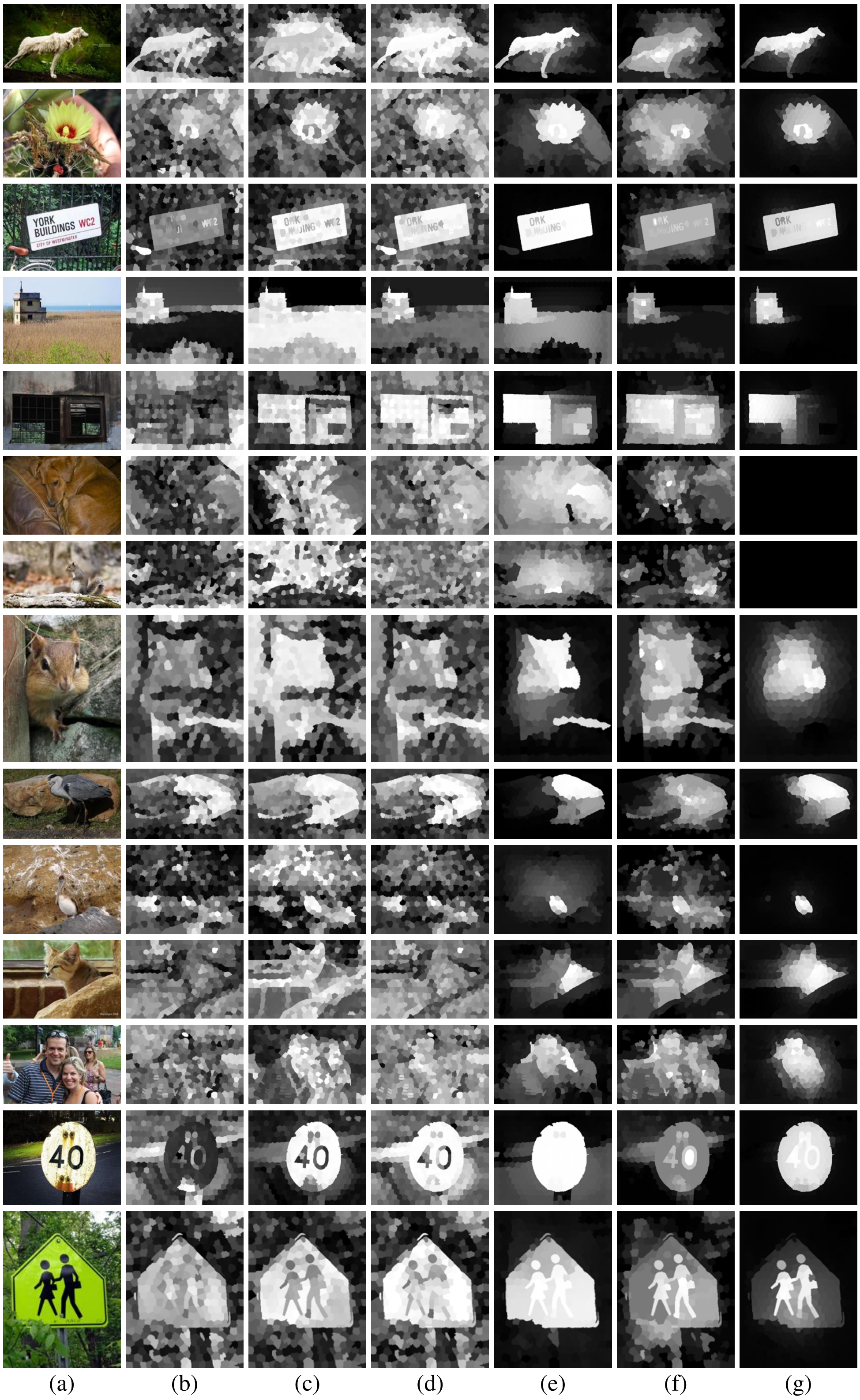


Fig. 3: Illustration of saliency features of randomly chosen images in the ECSSD dataset, computed on the Lab color histogram channel. From left to right: (a) input images, (b) global contrast, (c) spatial distribution, (d) backgroundness, (e) manifold ranking, (f) boundary connectivity, and (g) final saliency maps.

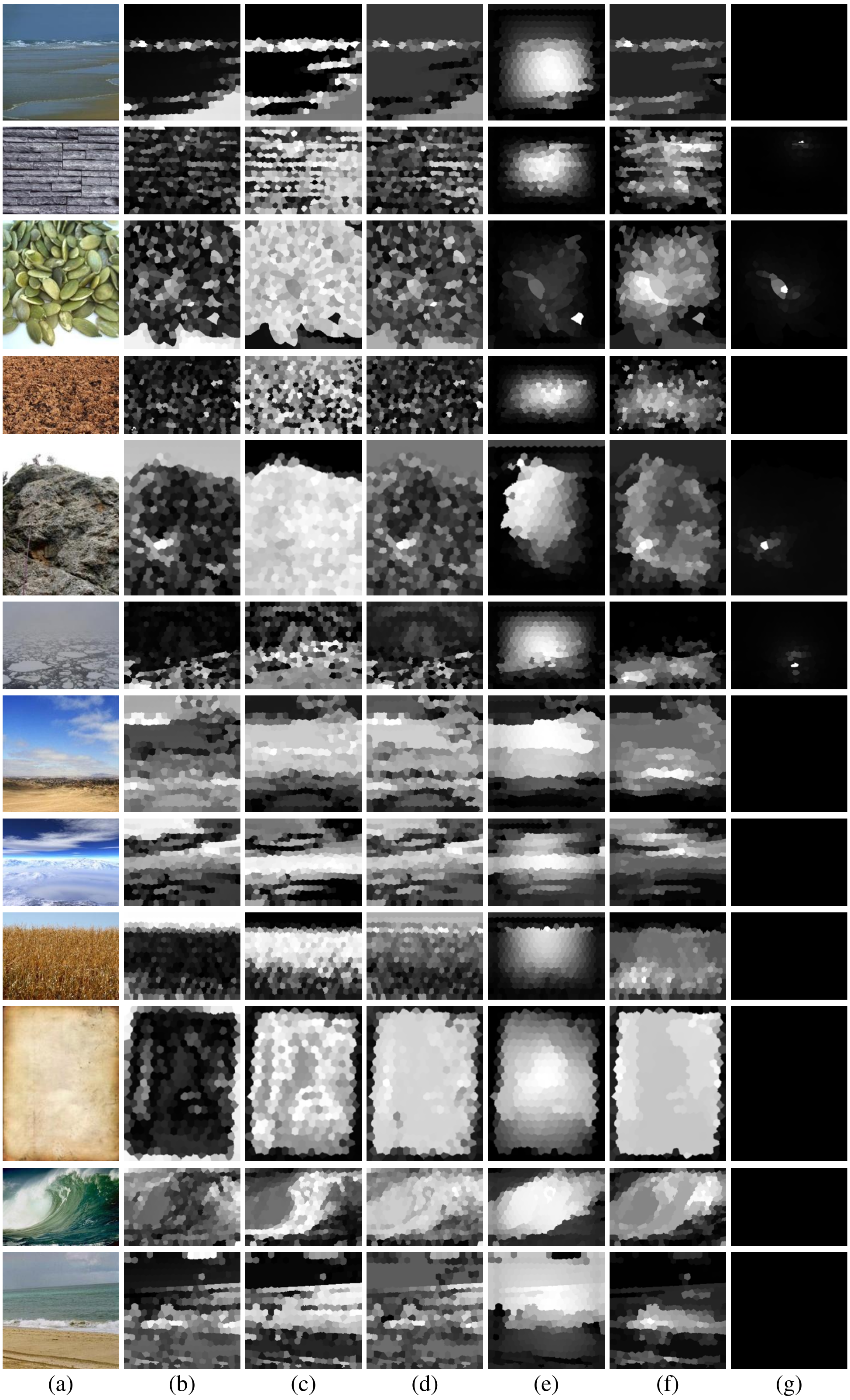
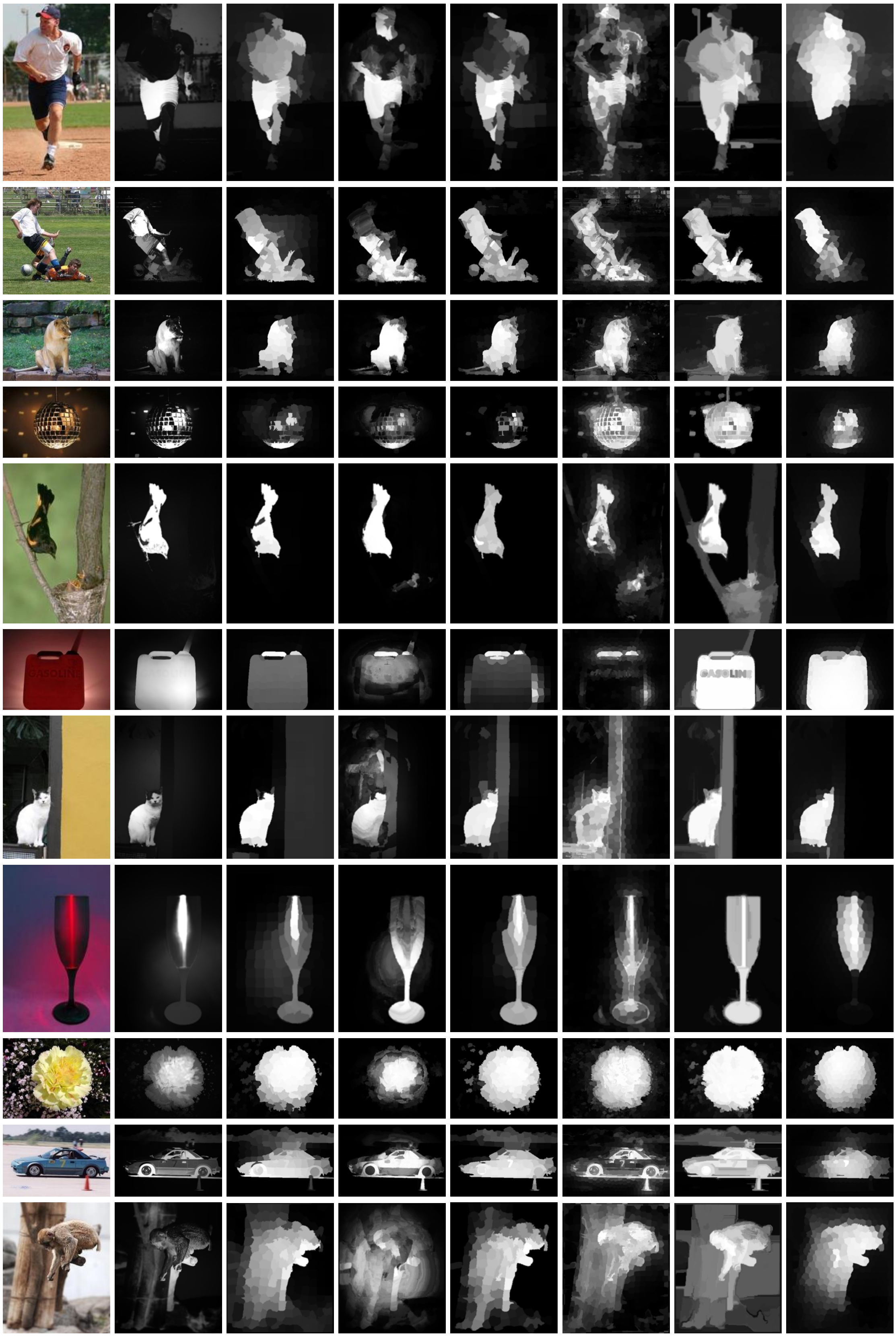


Fig. 4: Illustration of saliency features of randomly chosen images in our background dataset, computed on the Lab color histogram channel. From left to right: (a) input images, (b) global contrast, (c) spatial distribution, (d) backgroundness, (e) manifold ranking, (f) boundary connectivity, and (g) final saliency maps.



(a) input (b) SF [?] (c) GMR [?] (d) DSR [?] (e) RBD [?] (f) HDCT [?] (g) DRFI [?] (h) LSSVM

Fig. 5: Qualitative comparisons of randomly chosen saliency maps produced by different approaches on the MSRA-B dataset. From left to right: (a) input images, (b)-(g) saliency maps of state-of-the-art approaches, (h) saliency maps of our proposed approach LSSVM.

(a) input (b) SF [?] (c) GMR [?] (d) DSR [?] (e) RBD [?] (f) HDCT [?] (g) DRFI [?] (h) LSSVM

Fig. 6: Qualitative comparisons of randomly chosen saliency maps produced by different approaches on the ECSSD dataset. From left to right: (a) input images, (b)-(g) saliency maps of state-of-the-art approaches, (h) saliency maps of our proposed approach LSSVM.

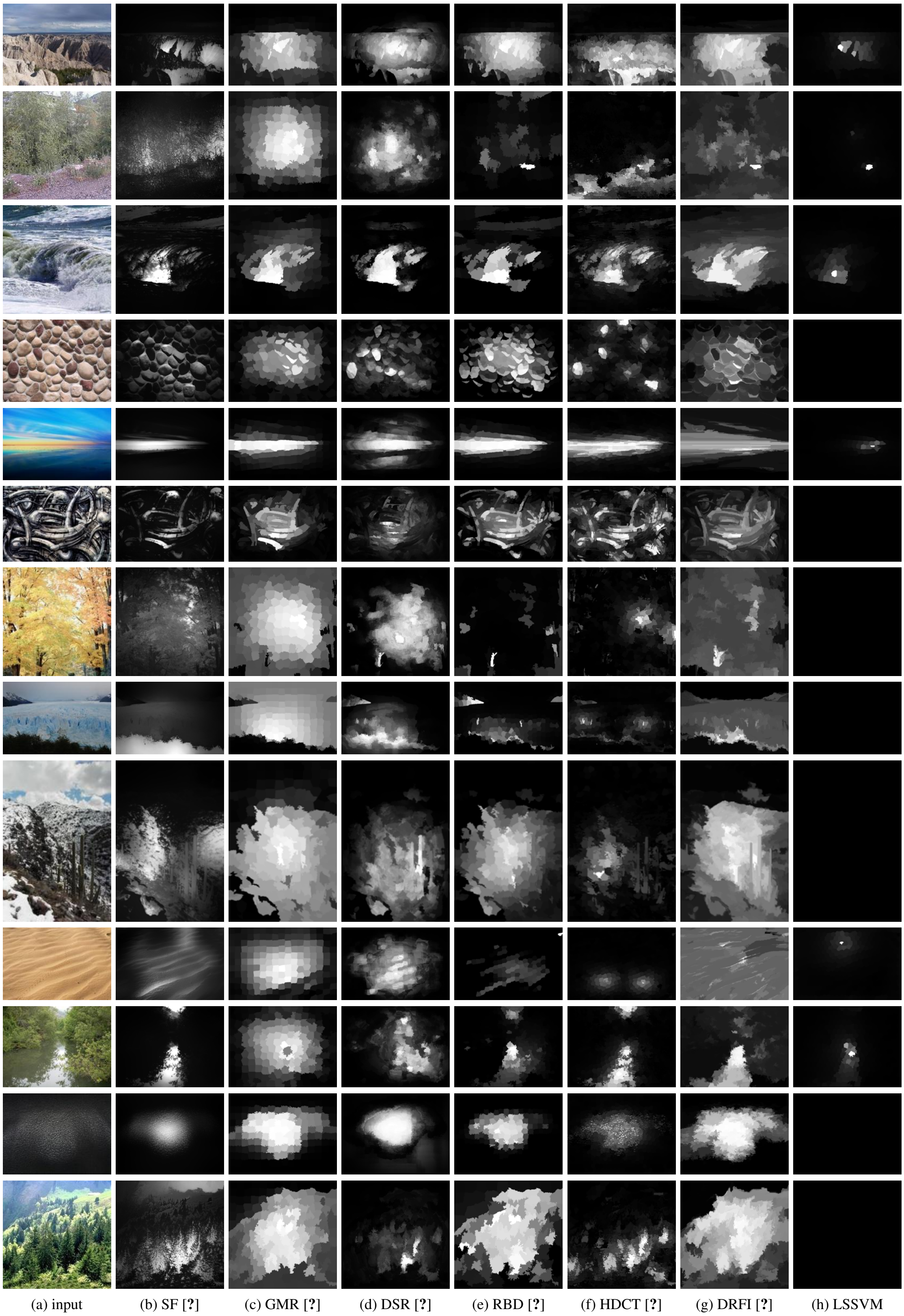


Fig. 7: Qualitative comparisons of randomly chosen saliency maps produced by different approaches on our background dataset. From left to right: (a) input images, (b)-(g) saliency maps of state-of-the-art approaches, (h) saliency maps of our proposed approach LSSVM.