# 3.3 VISUAL SALIENCY MODELLING

Visual saliency is mostly driven by two models. These two models have their root in completely different aspects. One model deals with unconscious while other relies on consciousness and prior knowledge of the object.

3.3.1 BOTTOM-UP MODEL

The core of visual salience is a bottom-up, stimulus-driven signal that announces "this location is sufficiently different from its surroundings to be worthy of your attention". This bottom-up deployment of attention towards salient locations can be strongly modulated or even sometimes overridden by top-down, user-driven factors. The bottom-up model is memory independent and stimulus driven i.e attention is instantaneously driven to most salient part in the image. Conscious mind is not involved in this model. Thus, a lone red object in a green field will be salient and will attract attention in a bottom-up manner. The pop-out cases suggest that the target can be effortlessly located by relying on preattentive visual processing over the entire visual scene.
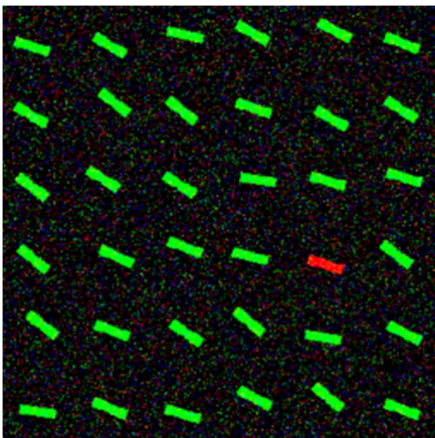
One item in the array of items strongly pops-out and effortlessly and immediately attracts attention. Thus the red bar is the most salient part in this image. Since no prior knowledge or conscious is involved this server as an example of bottom-up model.
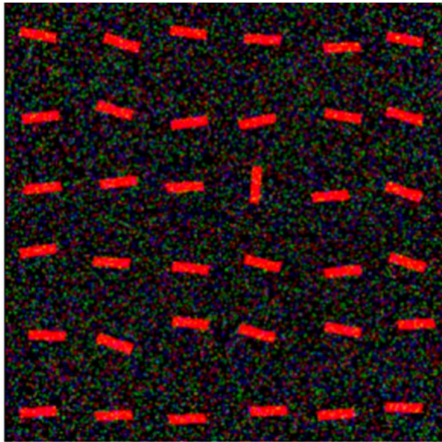
In this display, the vertical bar is visually salient. Comparing with above example, surroundings largely matters in making an object salient. Red bar in the above image is more salient because of its surroundings as compared to this red bar.
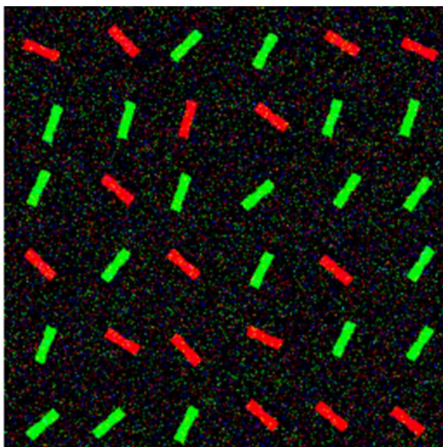
In this display, there is again one bar that is unique and different from all the other ones. But because its surrounding is not that different, there is little saliency to drive our attention. The vertical red bar in the top centre is the salient bar.

In natural environments, highly salient object tend to automatically draw attention towards them. Designers have long relied on their own salience system to create objects, which appears highly salient to others.

3.3.2 TOP-DOWN MODEL

The precise mechanisms by which voluntary shifts of attention are elicited remain elusive, although several studies have narrowed down the brain areas primarily involved.

Introspection easily reveals that we are able to voluntarily shift attention towards any location in our visual field, no matter how inconspicuous those locations may be. Experiments have demonstrated top-down shifts of attention. A typical experiment involves cueing an observer towards one of several possible identical stimuli, but only at a high cognitive level, so that nothing in the visual display distinguishes the target from distractors. Thus, we appear to also be able to voluntarily select the specific features of a stimulus. These results suggest a top-down model for visual saliency which is driven by our prior knowledge and our conscious mind. Early visual processing happens in top-down model based on prior knowledge whereas no such thing happens in bottom-up model and is completely instantaneous.

This model works if you have some prior knowledge of the required object or you have something about the object in your conscious mind.

The above figure is an example of top down model. If one forget about the green circle li highlight the car then one has to know what he is looking in this forest. So prior knowledge is required to spot the car which is also the most salient object in this scene.