Selective Search Region Proposals

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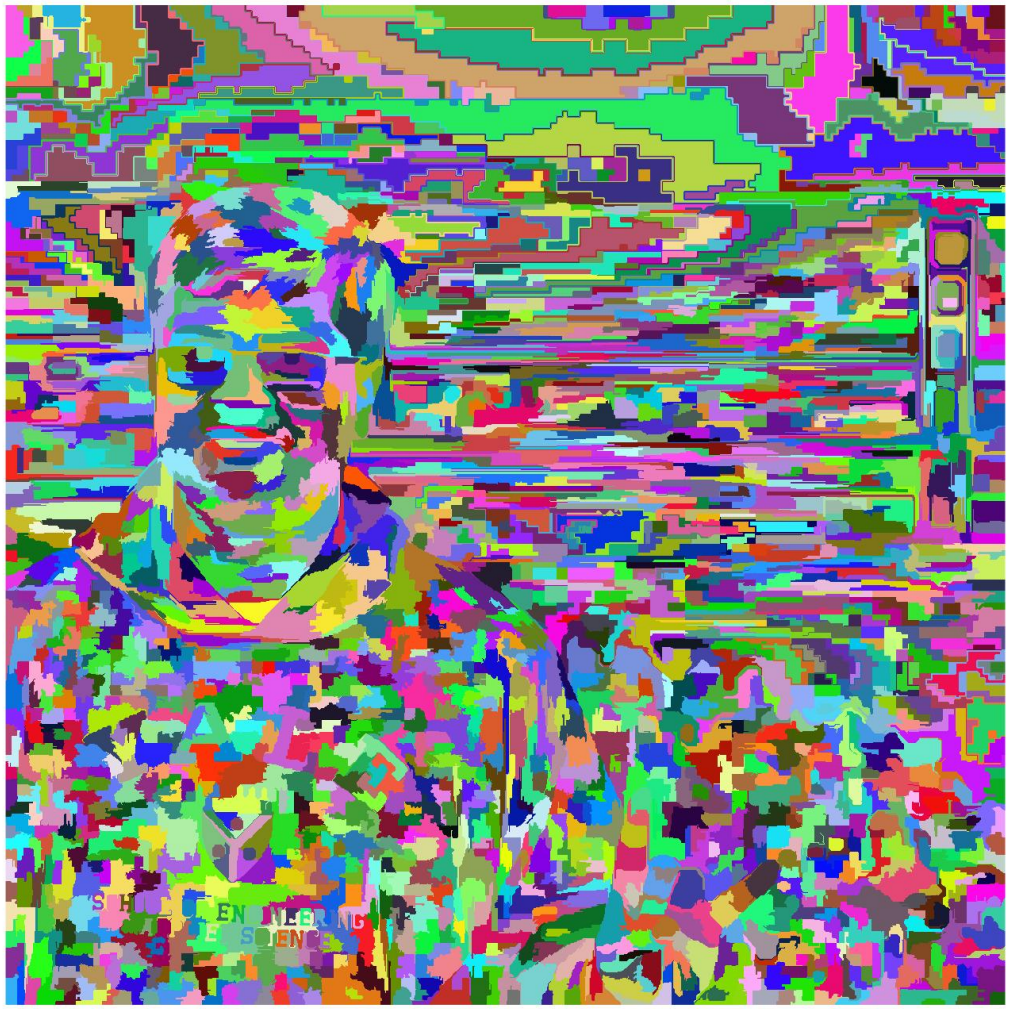
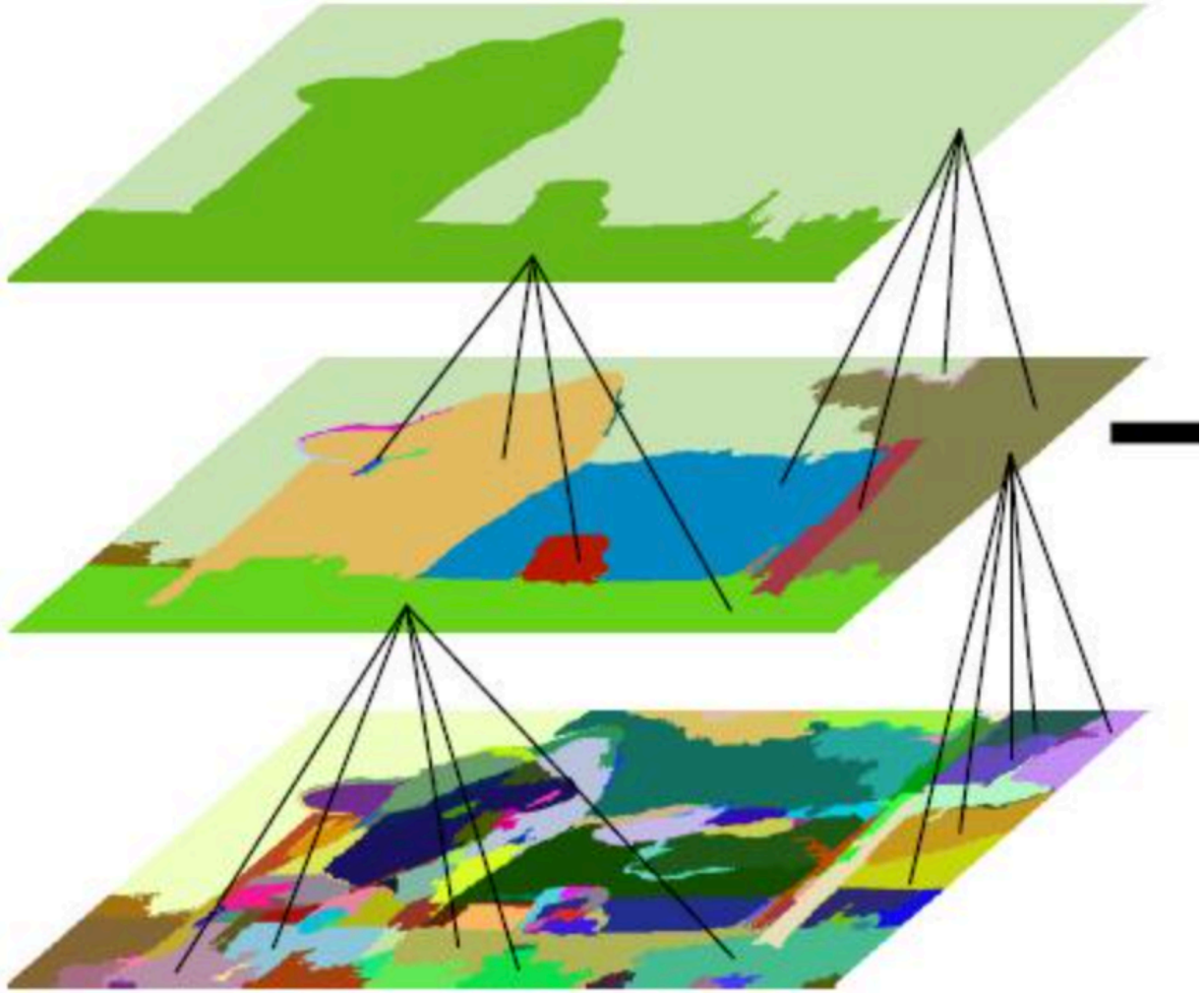
Over-segmentation (Graph-Based Image Segmentation)



Pedro Felzenszwalb's graph-based segmentation

Selective Search Based Hierarchical Pooling

Greedy
Pooling



$$S(a, b) = S_{size}(a, b) + S_{texture}(a, b)$$

Intersection Over Union (S_size)

Which has higher S_size ?

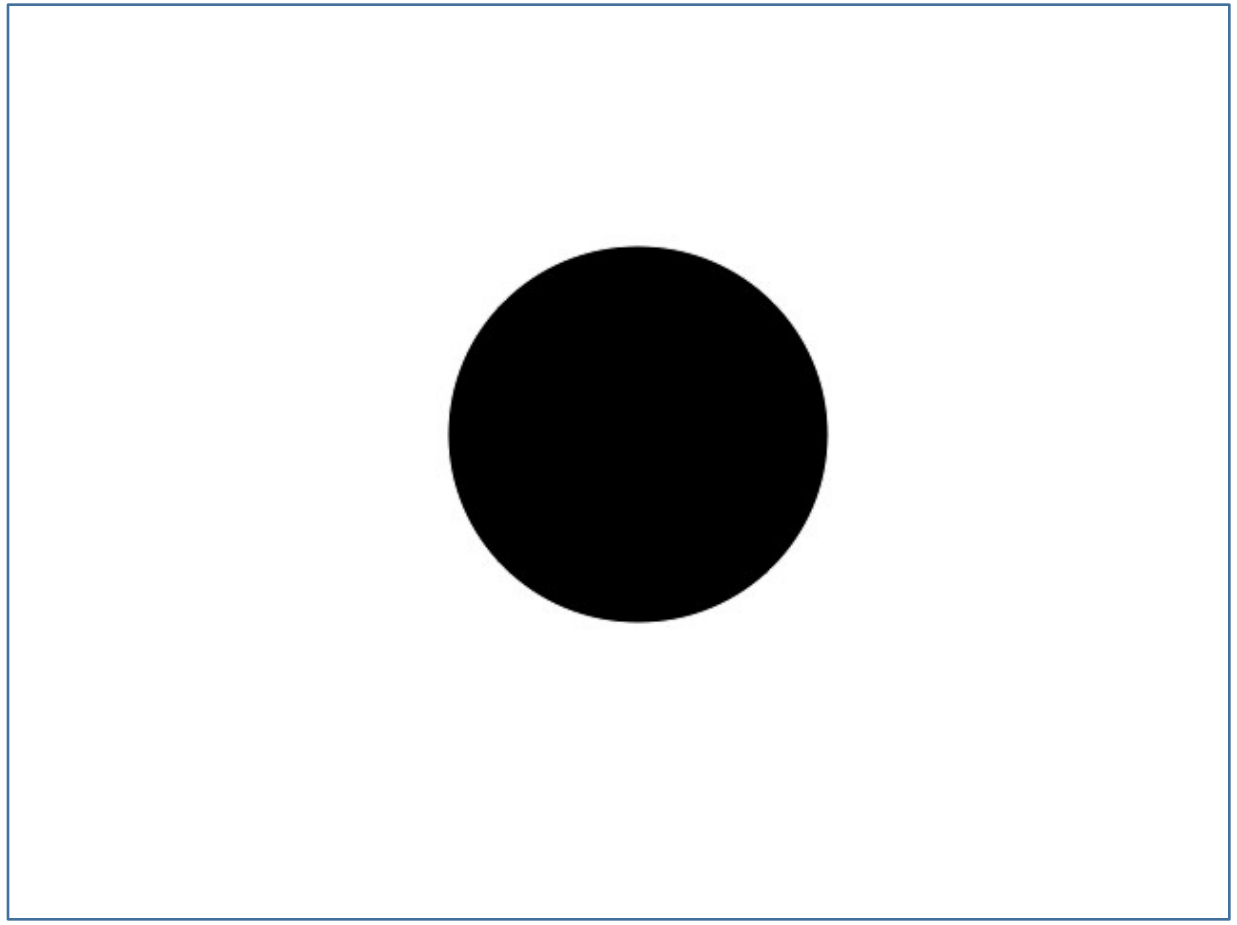

houten speelgoed
DON ESTILO

Hierarchy Pooling Demo

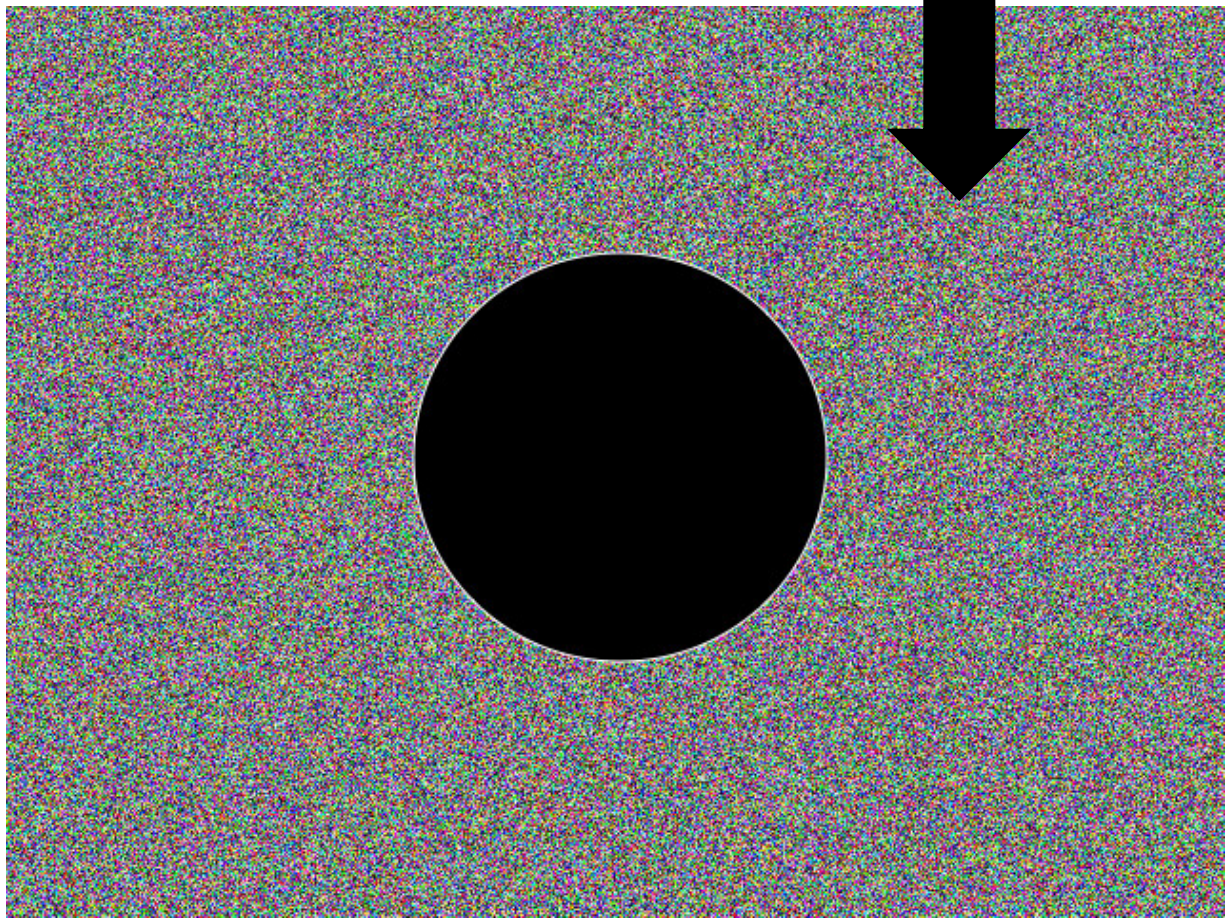
Credit : https://github.com/belltailjp/selective_search_py

Box Proposal (For all levels of pooling)

Recall Based Approach

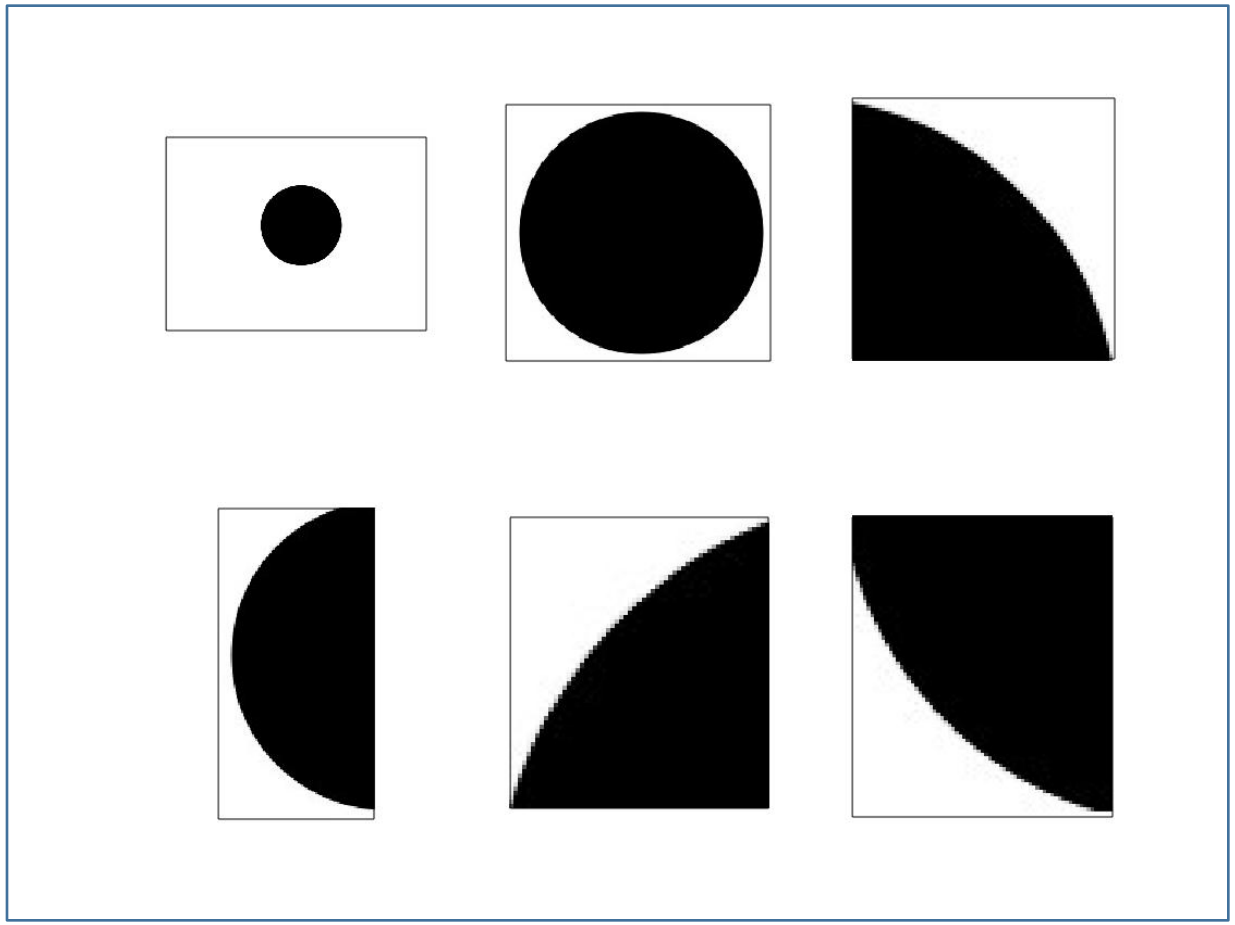


White Noise



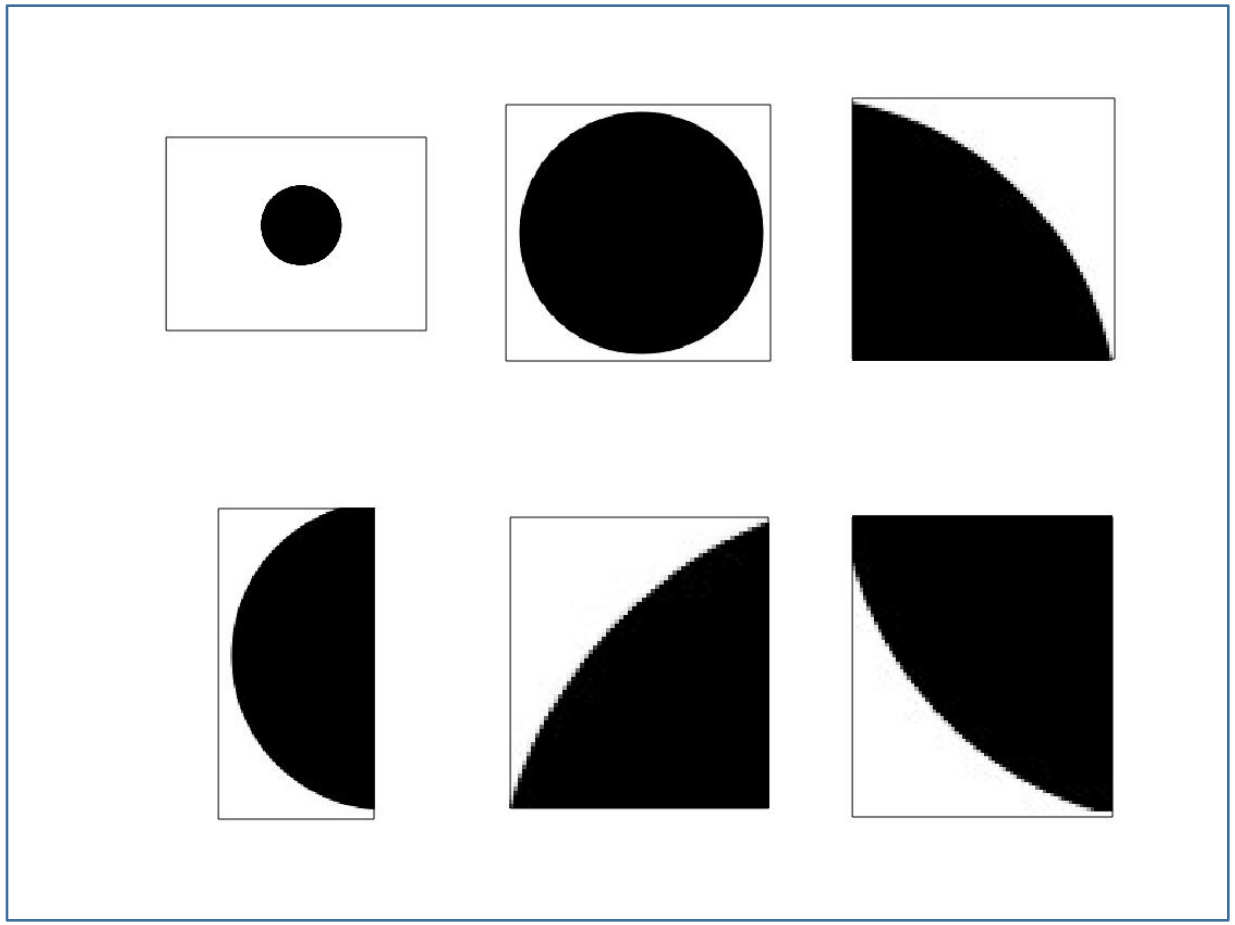
If we were to give region proposals, the circle would be part of all of them ?

What we would expect !!!!

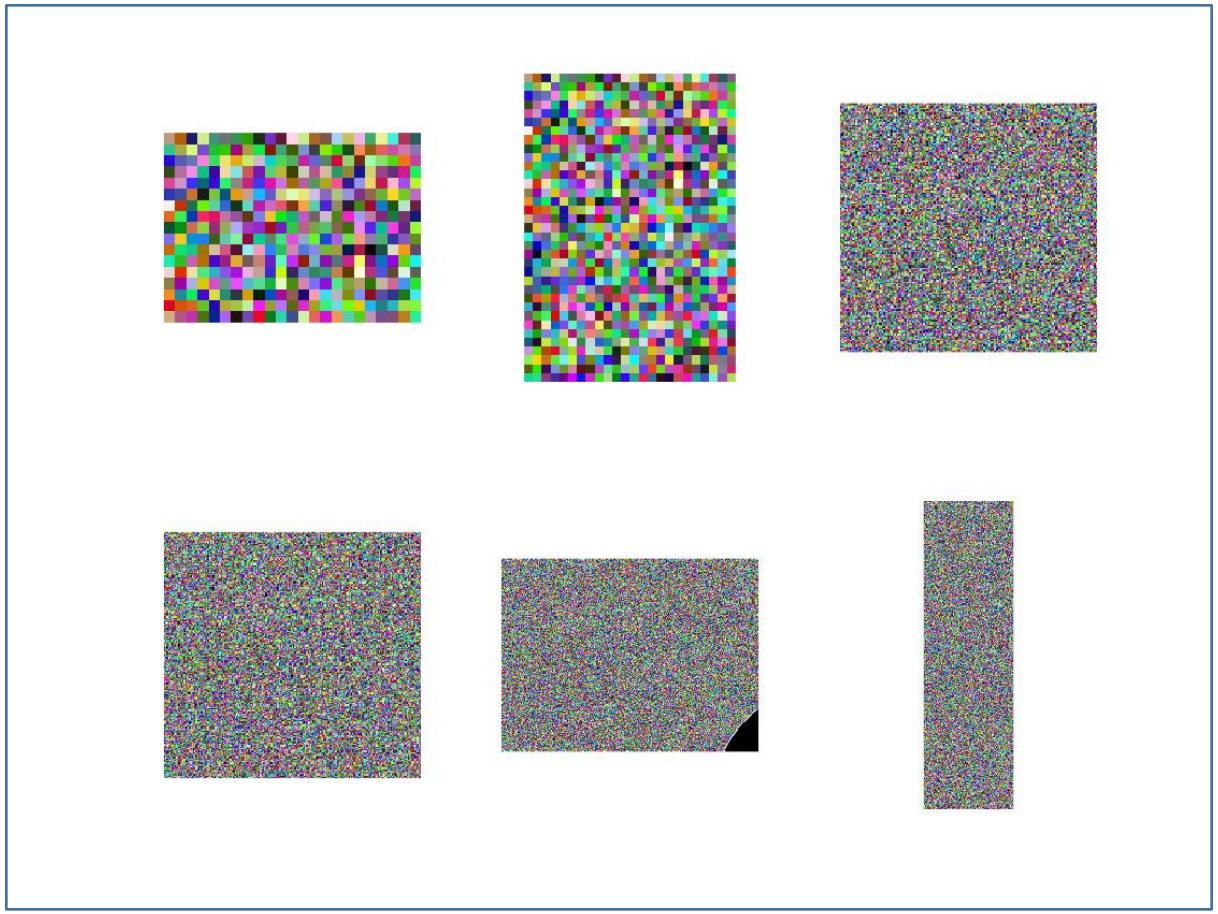


123 proposals

3217 proposals



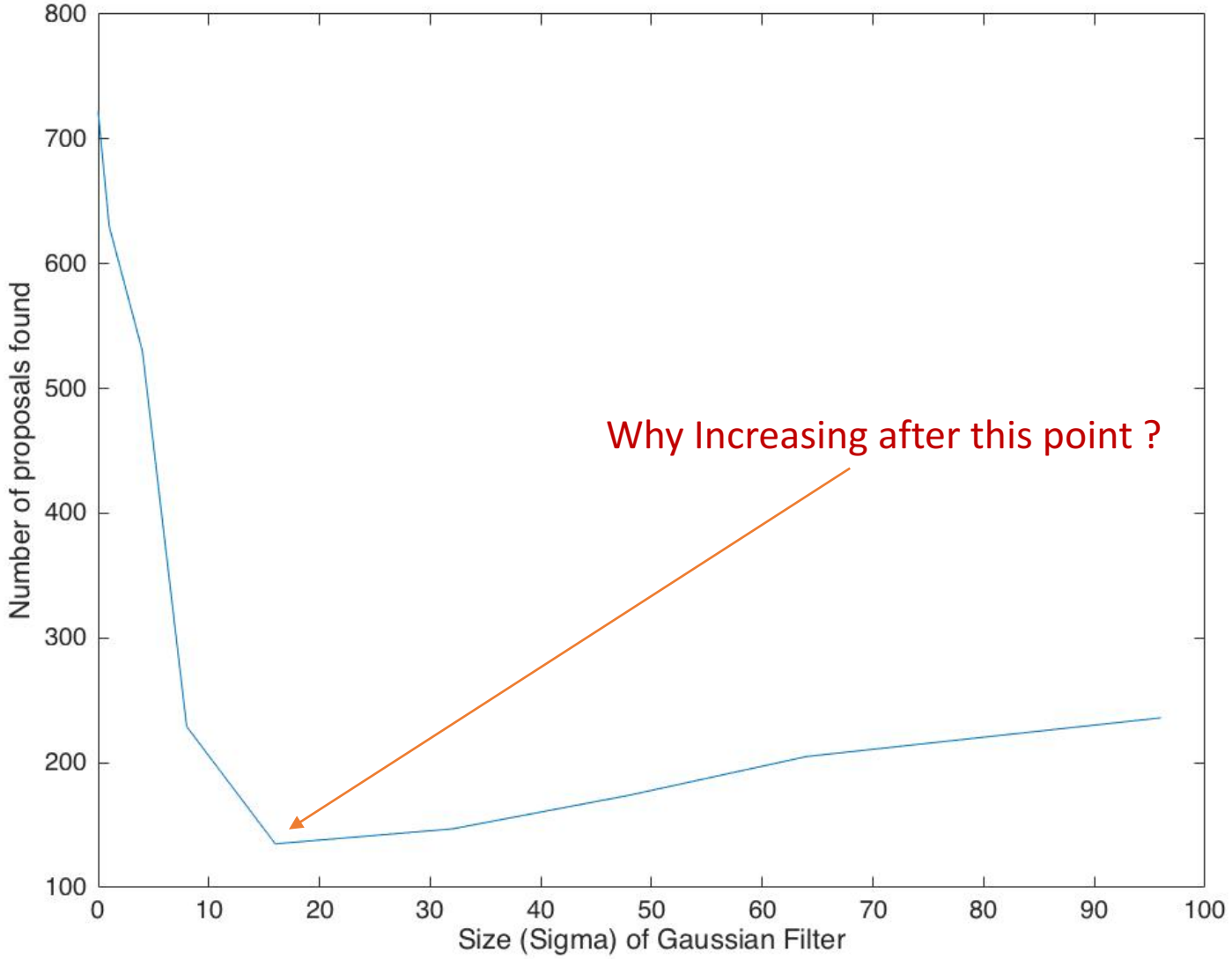
What you get

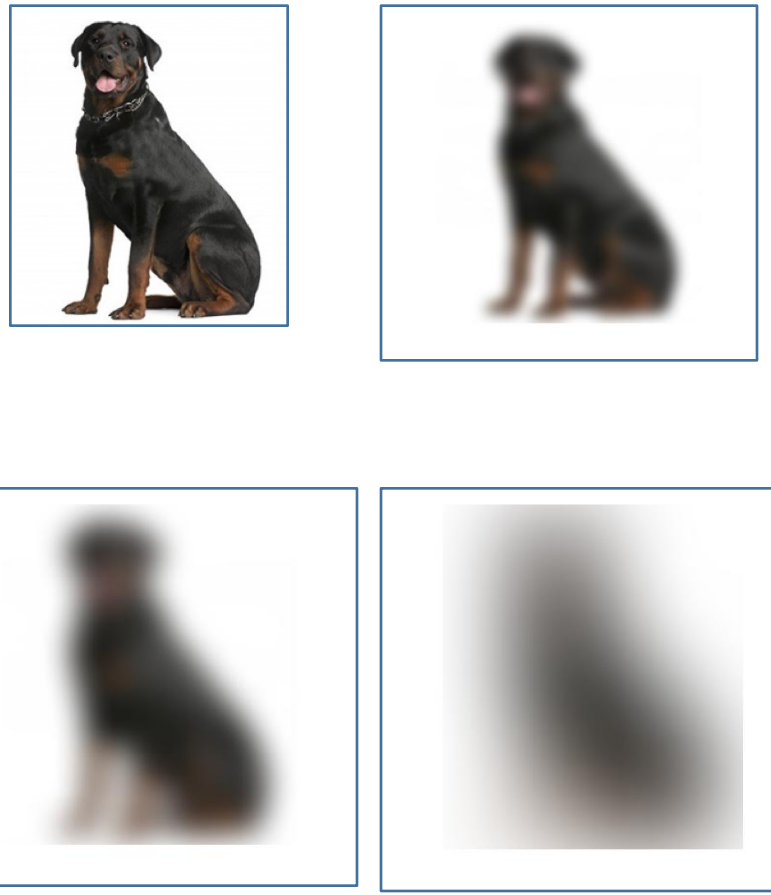


It can’t afford to lose the actual proposals, by doing intelligent things to get rid of noise.

Essential to the task of object recognition

Blur Effects





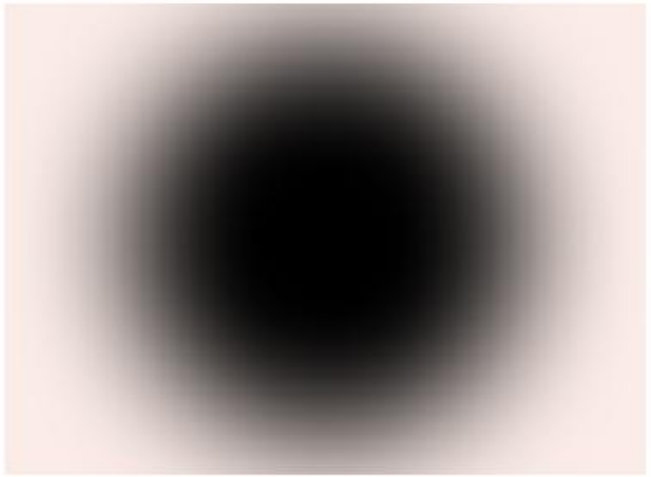
Gaussian Filter

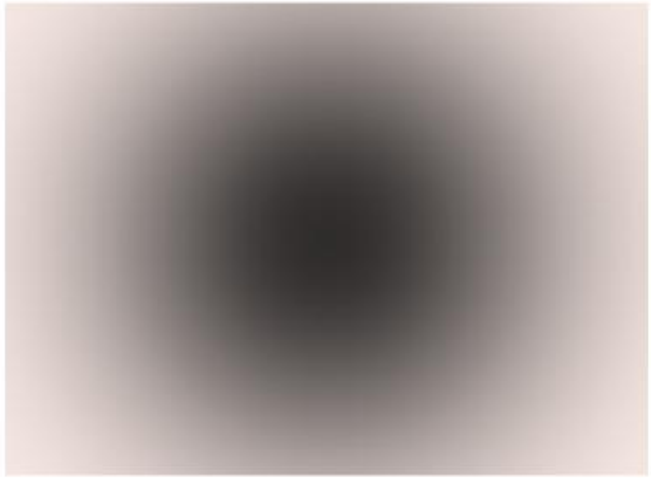
Drop Explanation
Over segmentation Result (k = 10)

Original

Sigma = 32

Increase Explanation

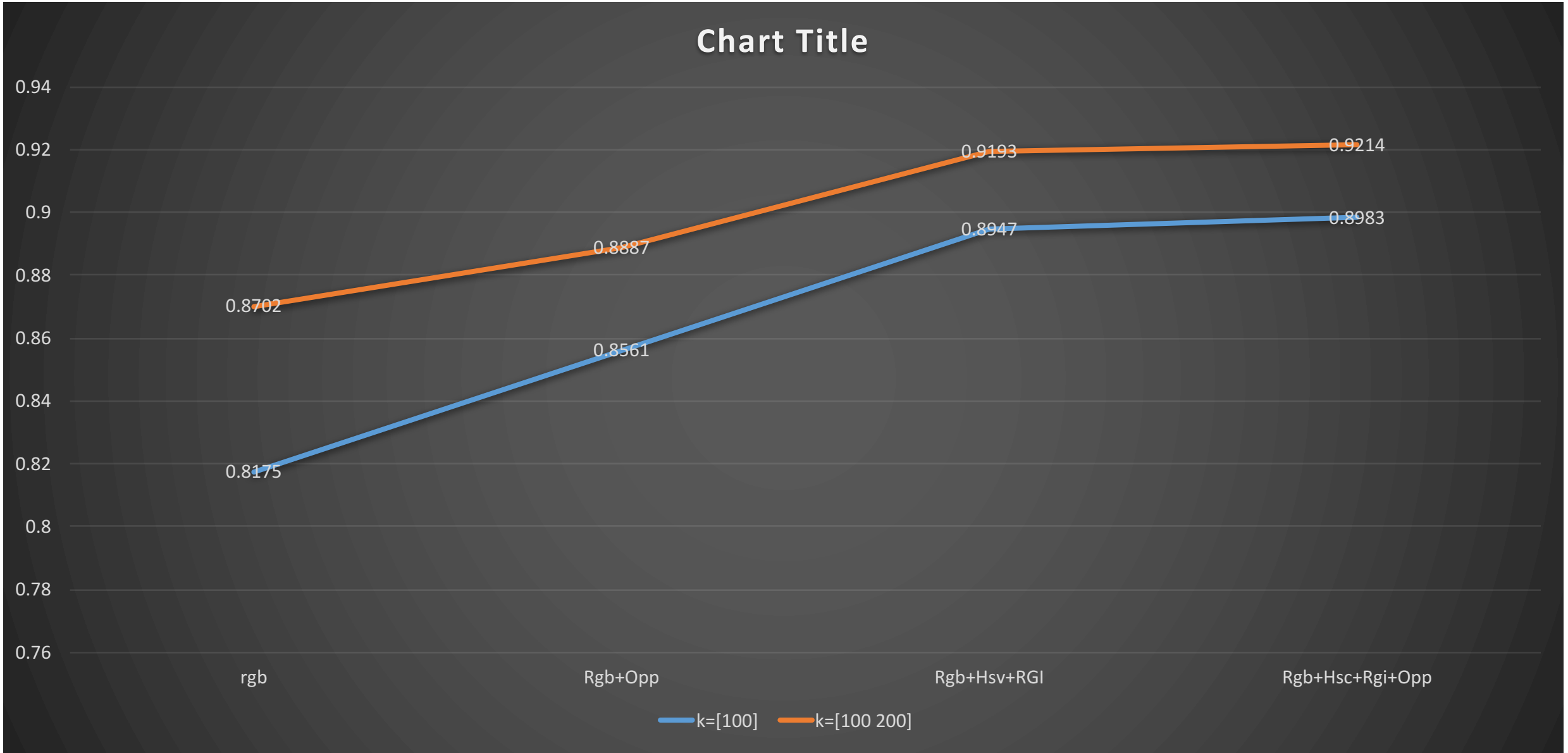




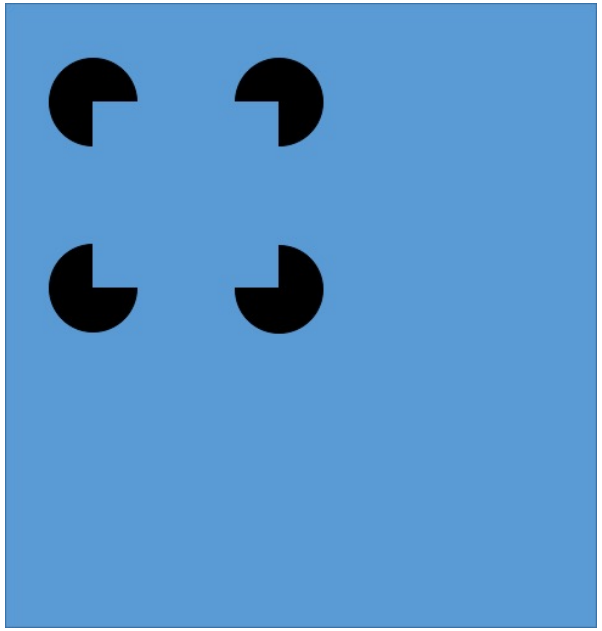
Effect of Cues

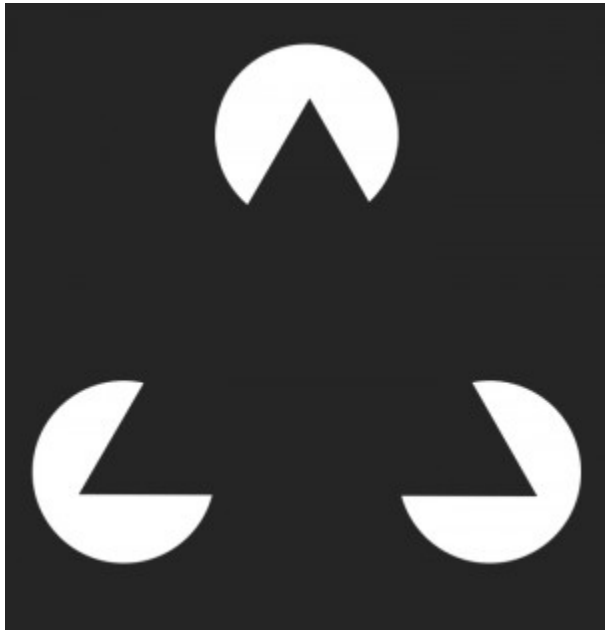
- Threshold (k)
- Color Cues

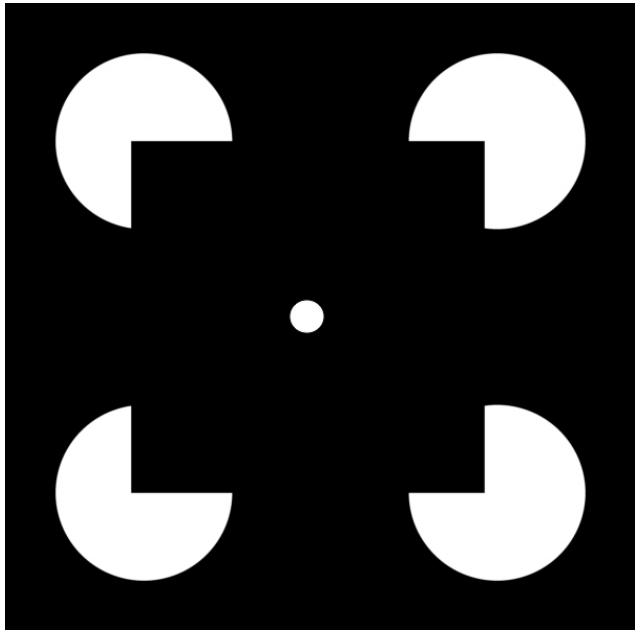
Recall Plot on Pascal VOC (1 class)



Semantic Performance





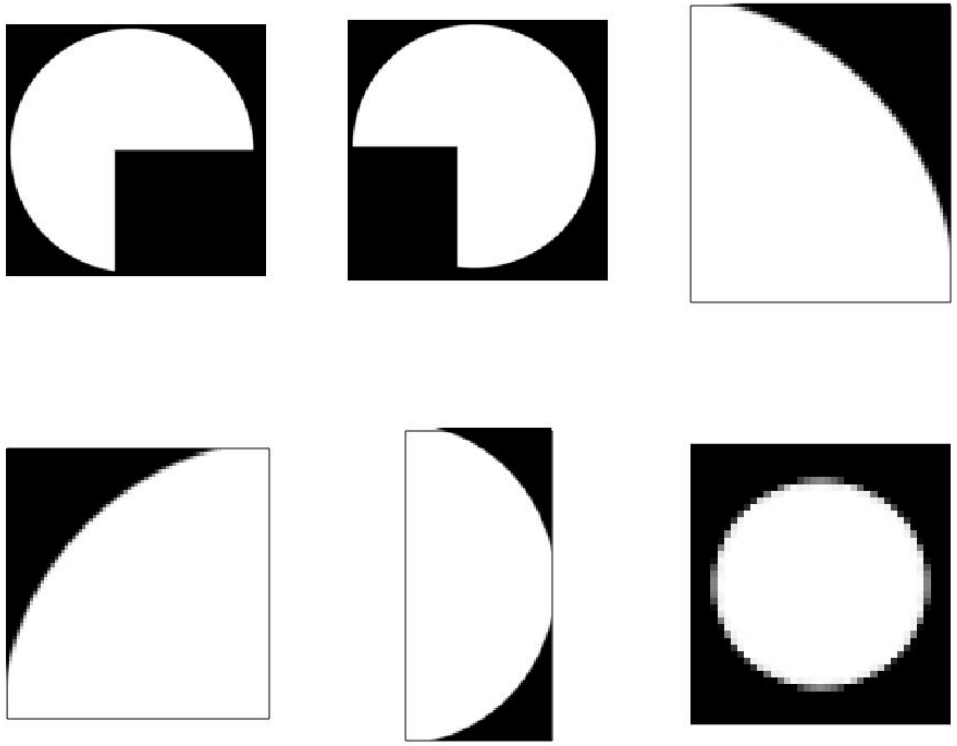


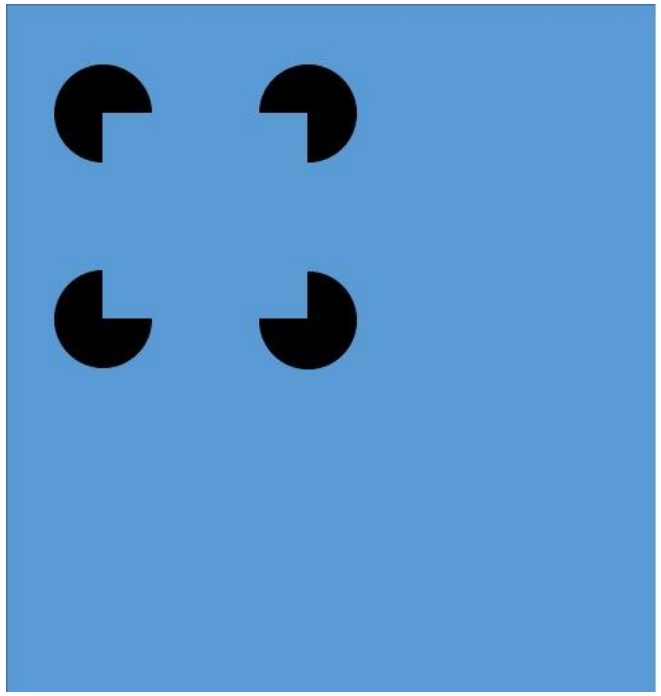
What do you see ?

Difference between Fig 1 and Fig 3 – Former taken to break symmetry.

No Triangles …. No Squares ….

Semantically Unsound

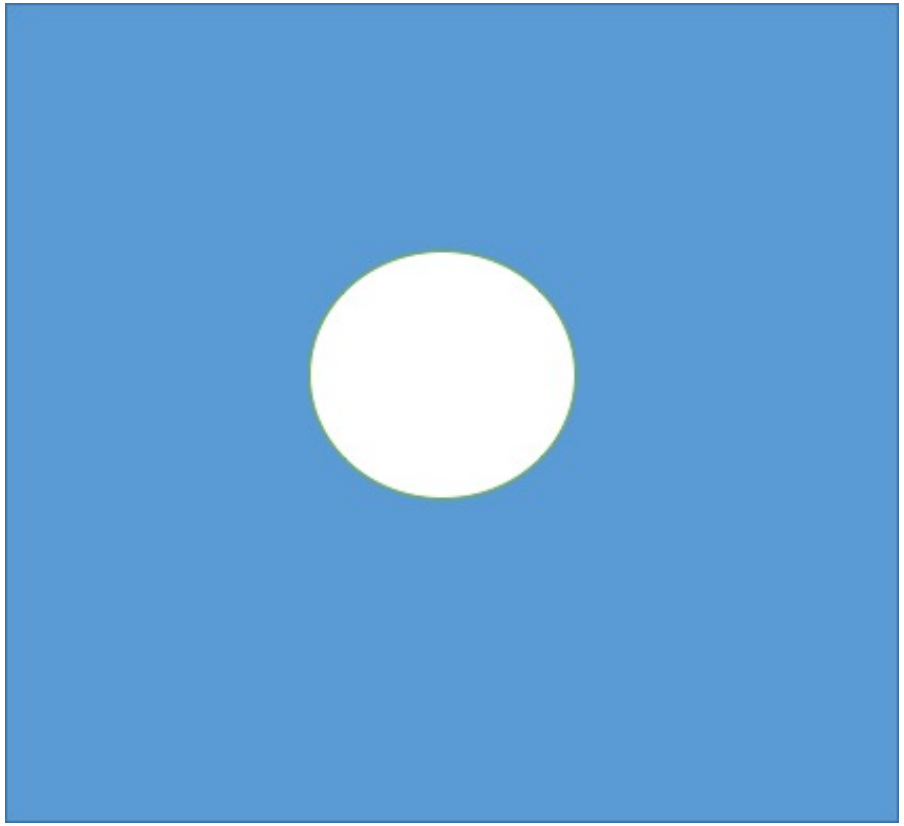


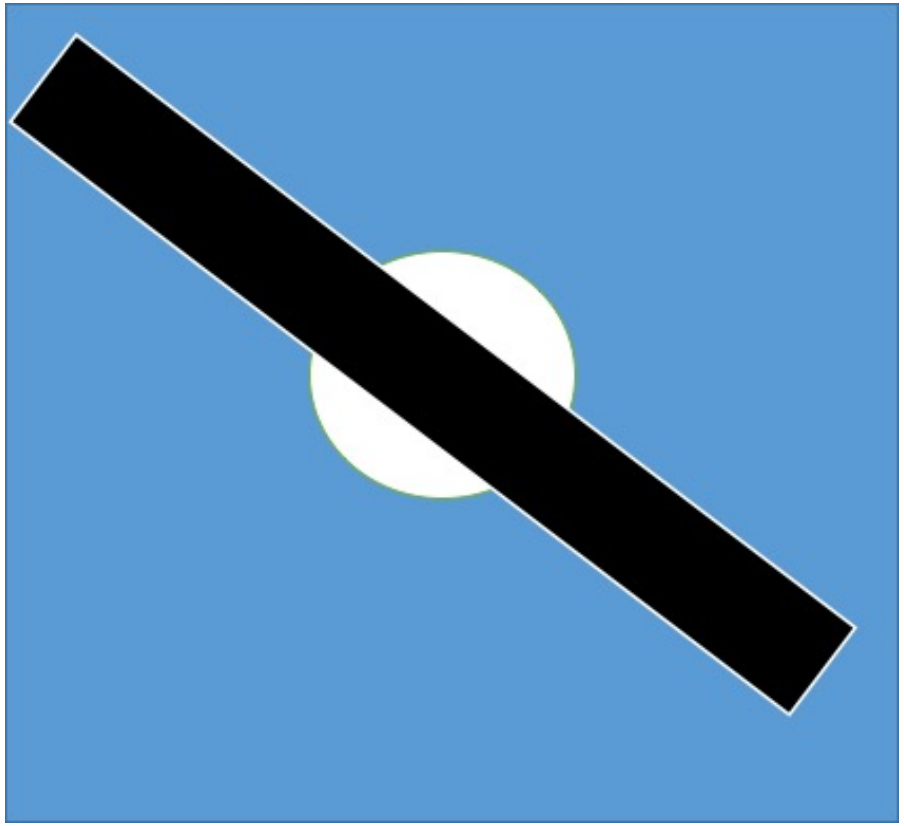


Out of 181 region proposal, none could identify the square

Similarly for The other triangle image and the non-symmetric square

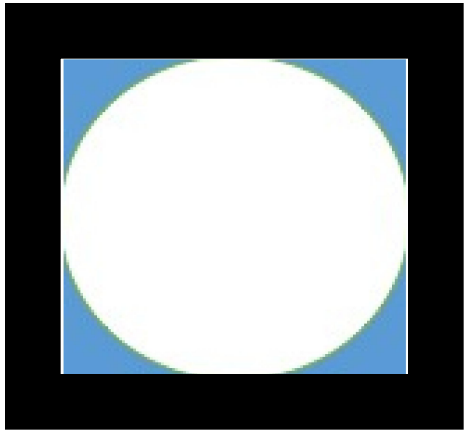
Occlusion



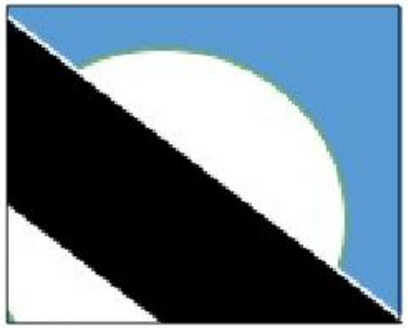


Will It Find the Circle ???

Will It Find the Circle ??? Yes



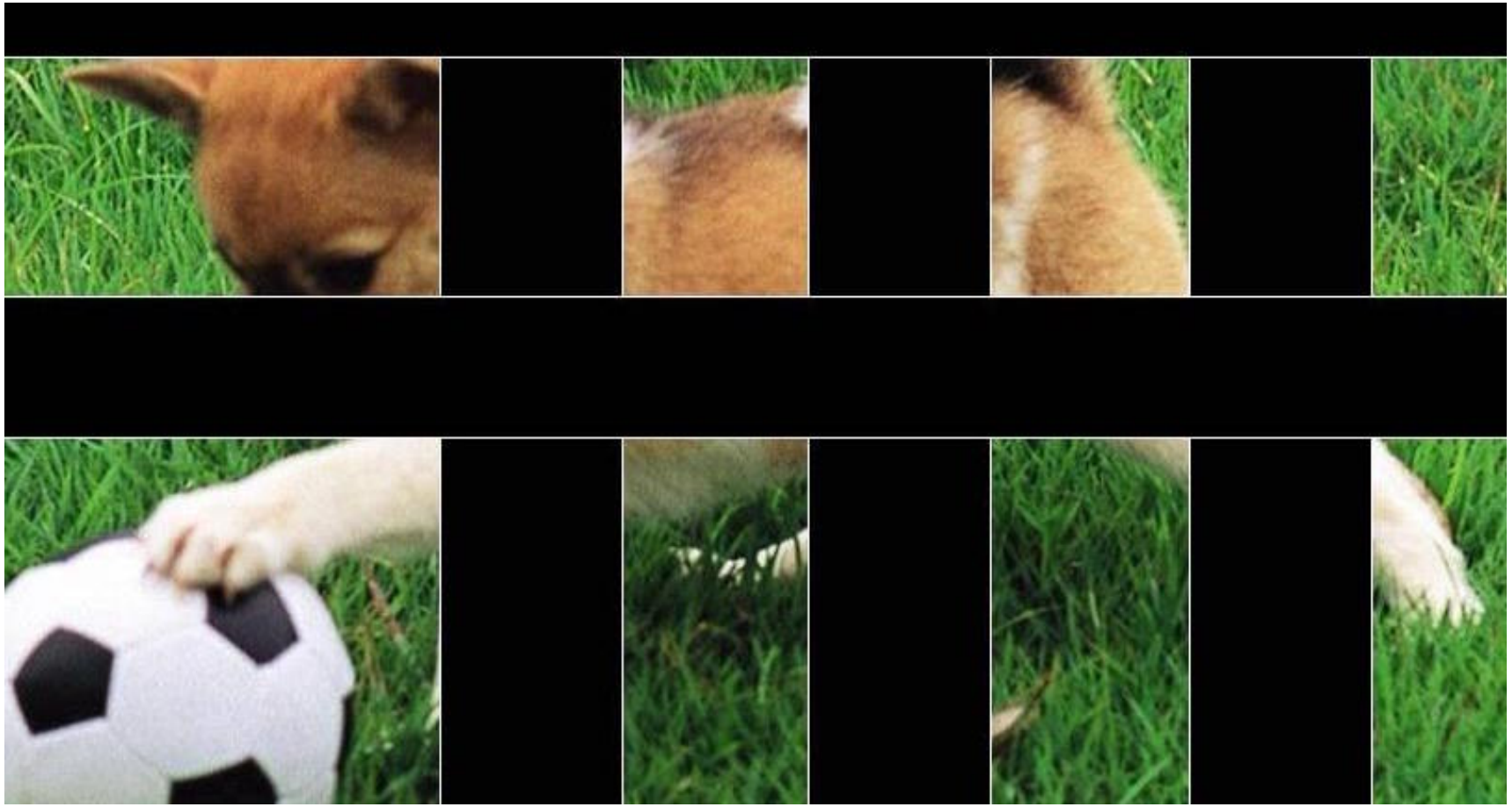
Though Distorted …. But Still Identifies the Circle.



One More Example….

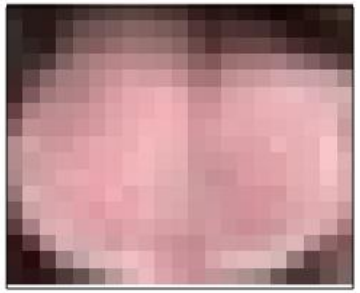
Was Dog Found in the original image ? Yes

Was the Dog found in the occluded image ? Yes



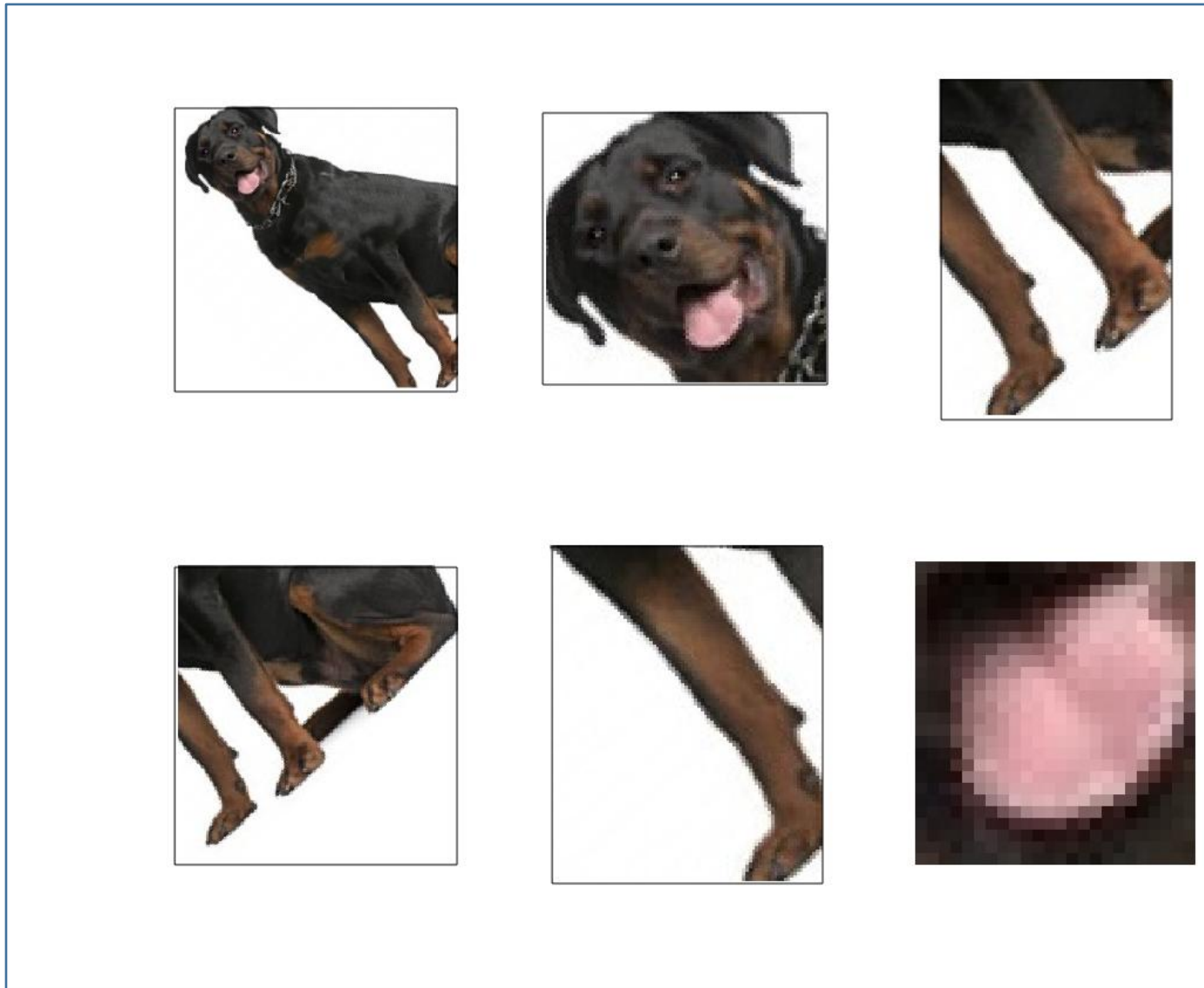
Rotation

Original Image Proposals



Why ? The segment pooling hierarchy is invariant to orientation and translation of segments.
The hierarchy itself makes it invariant to Scaling

Rotated Image Proposals



Key Takeaway

- Selective Search Region Proposal is a recall focused metric.
- Selective Search, pools similar texture and similar size segments together, by the advent of the ranking parameter.
- Gaussian Blur can help remove noise or clutter to be identified as region proposal, but too much of it, can alter the original image, and generate zombie proposals that don't exist on original image.
- Selective Search is semantically unsound – It only responds to intensity and texture.
- It is fairly robust to
  - Occlusion
  - Rotation
  - Translation
  - Scaling

Questions ?

References

- http://koen.me/research/selectivesearch/
  - Contains the Paper and Matlab Implementation
- Python Implementation - https://github.com/belltailjp/selective_search_py
- Oversegmentation – C++ Code - http://cs.brown.edu/~pff/segment/

Thank You