Fast Unsupervised Object Localization

Anjan Dwaraknath(anjandn@stanford.edu), Deepak Menghani(deemeng@stanford.edu), Mihir Mongia(mmongia@stanford.edu)

Motivations

There are many applications where it is easy to get an object classification data set but where getting bounding box data is very unrealistic. This could happen in very specialized settings such as in medicine or astronomy. Here professionals with lots of knowledge expertise do not have time to waste on making bounding boxes.

Fast Object Localization

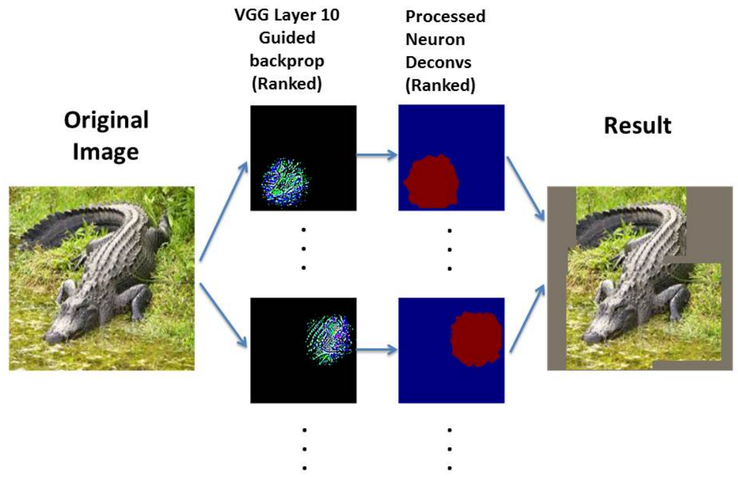
We have built an algorithm that can quickly localize important aspects of objects using a pre-trained classification neural network. Our algorithm uses one forward pass and 5 partial backward passes into the image.




Algorithm Outline

1. Forward Pass to identify the class of the image
2. By a heuristic identify the 5 most important neurons in layer 11.
3. "Guided" back propagation from each of the 5 neurons back into the image to identify region of localization

Algorithm Visualization



Ranking Neuron Heuristic

In one forward pass there are hundreds of neurons in layer 11 that fire high, but how do we choose which ones will represent the important locations of the original image. Our strategy is to use the subset of the high activations neurons that also affect the class score highly. In order to measure which neurons affect the class scores highly we also take the gradient of the class score of interest with respect to the neurons in layer 11.

Results

- Fast Localization - 1 forward pass and 6 backward passes
- Can query algorithm to pick a certain class from an image containing objects of many classes

Future Work

- Choosing which combinations of neurons to back propagate into the image
- Validation of algorithm using literature benchmarks
- Adapting our algorithm for instance segmentation

Conclusion

- A neural network only trained for classification has significant information about location
- **Using a heavily trained neural network for classification only, Is like driving a Ferrari at 10 mph.**