Basic Definitions
- Feature map
- Activation

Black Box
- CNN/DNN produce state-of-the-art results
  - Classification
  - Detection
  - Segmentation
- How does it work?
  - First convolutional layer
  - Non-linear & irreversible operators
  - Network visualization

Example

VISUALIZING AND UNDERSTANDING CONVOLUTIONAL NETWORKS
Matthew D. Zeiler and Rob Fergus
Dept. of Computer Science, New York University, USA
Deconvolutional Networks

Feature map of size A
ReLU
Max pooling
Saving switches
Size A
Unpooling
Size A
ReLU
Deconvolution

End of convolutional operations for this layer

Convolution

Unpooling

Deconvolutional Networks

Feature map of size A
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Max pooling
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Unpooling
Size A
ReLU
Deconvolution

End of convolutional operations for this layer

Convolution

Unpooling

Adaptive Deconvolutional Networks for Mid and High Level Feature Learning
Improving State of The Art results

- ILSVRC 2012 winners: Krizhevsky et al.
- No mid frequency
- Aliasing

Usage For Insight on Classification

Practice Makes Better
OBJECT DETECTORS EMERGE IN DEEP SCENE CNNS

Bolei Zhou, Aditya Khosla, Agata Lapedriza, Aude Oliva, Antonio Torralba
Computer Science and Artificial Intelligence Laboratory, MIT

The Network

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Simplifying the Input Images

- Segmentation of the input images
- Iteratively searching for the least contributing segment in the scene classification task
- Stop algorithm when the network cannot recognize the scene.

What is A Receptive Field?

Visualization Method
IDENTIFYING THE SEMANTICS OF INTERNAL UNITS

Results Interpretation
Why Does it Happens?

Conclusions

- We saw two different visualization methods
  - Deconvolution networks
  - 3DF
- We saw the importance of visualization in understanding DNN
  - Improving current architectures
  - Imposing new tasks to current networks