Deep Learning for Image Captioning

By
Siddesh Pillai (srp4698@rit.edu)

Advisor : Professor Jeremy Brown (jxbvcs@rit.edu)
Colloquium Advisor : Professor Leon Reznik (lr@cs.rit.edu)

Introduction (1/4)

- Deep Learning is a rapidly growing segment in AI
- Deep Learning is machine perception; ability of a machine to interpret using complex models which help us classify, cluster and predict

Algorithms that mimics the human brain

Experts: Andrew Ng, Yann LeCunn, Geoffrey Hinton, Yoshua Bengio, Li Fei-Fei, Alan Karpathy etc.

Image is taken from google

Introduction (2/4)

- Some context aware applications such as
  - Voice Recognition – Uses a deep Long Short-Term Memory (LSTM) recurrent neural network for acoustic modelling of speech recognition http://googleresearch.blogspot.ch/2015/09/google-voice-search-faster-and-more.html

Image is taken from google

Introduction (3/4)

- Image Search – http://googleresearch.blogspot.com/2013/06/improving-photo-search-step-across.html

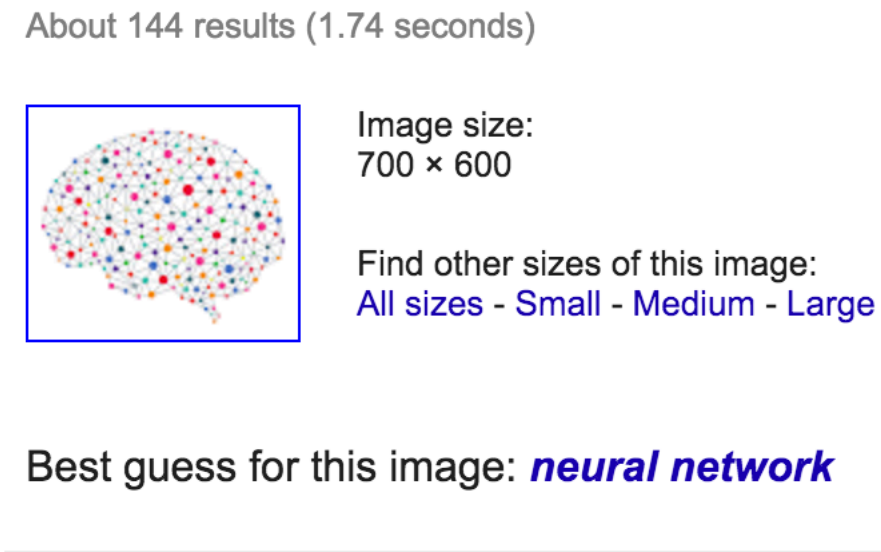


Image is taken from google

Introduction (4/4)

- Some of the areas explored using deep learning are scene detection, emotion detection, smart assistant, facial recognition, self driving vehicles, etc.

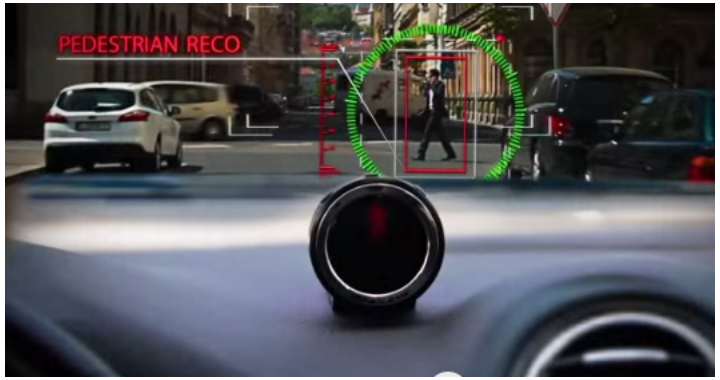
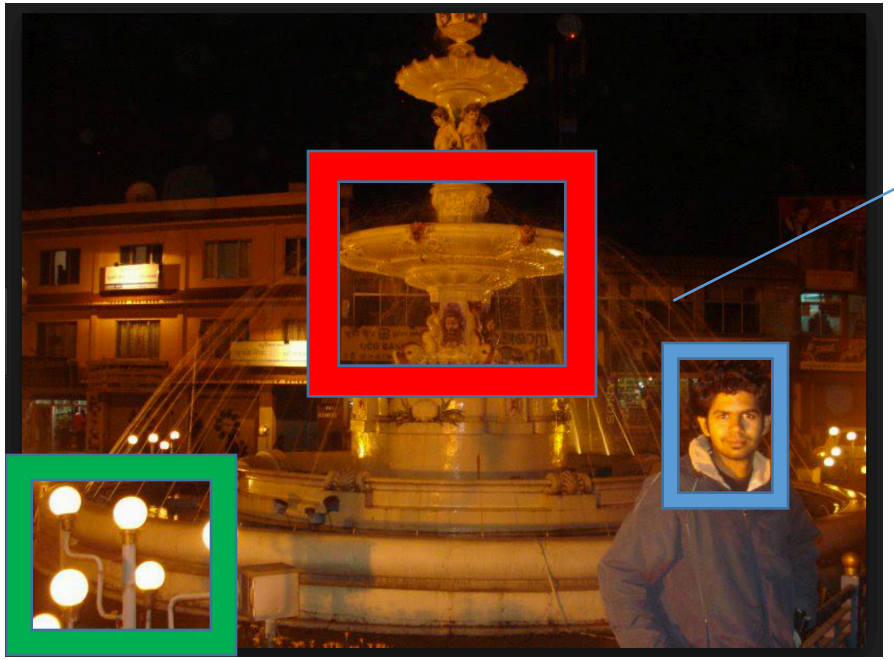


Image source: https://www.google.com/selfdrivingcar/ , http://www.computervisionblog.com/2015/03/mobileyes-quest-to-put-deep-learning.html

The Problem

- The aim is Image Captioning using deep learning techniques
- The general idea is you capture an image and the application will perform the object recognition and provide a semantic description of the scene



lamp, person, fountain (object recognition)

A person is near to lamp and fountain (semantic description)

How is it different to Google Image Search?

- Google Image search – Analyzes the images' distinct features such as lines, points, textures and creates a mathematical model which searches against the billions on images and retrieve similar images, show the best guess and webpages associated with the best guess.
- This experiment is through supervised learning, CNN for object recognition and I will be fine tuning some features at the fully connected layers of the CNN which then fed LSTM recurrent network.

Related Work

- Dense Image Annotations
  - Holistic scene [1] understanding in which the scene type, object and their spatial support of an image is inferred
- Generating Descriptions
  - Developed a log-bilinear model [2] which generates the full description of the images however their model uses a fixed window context
- Neural Network in visual and language domains
  - Convolutional Neural Network [3] [4] has emerged as the most efficient for image classification and recognition

Milestones

- Milestone 1
  - Datasets – Confirm the image data set(Flickr) 40k images (35k training + 3k test + 2k validation)
  - Explore the torch library
  - Train (Supervised learning) the dataset on my machine using convolutional and recurrent neural network and test for image recognition

Milestones

- Milestone 2
  - Derive the sematic alignment of words from the image recognition process using a multimodal recurrent neural network
  - Score the accuracy of the natural language descriptions of the images
- Milestone 3
  - Develop an android app which will provide an interface of this experiment
  - Code freeze
  - Measure the results and efficiency
  - Document the project
  - Design the poster

Expected Results

- Successfully train the images
- Measure the accuracy of Object Recognition
- Score the correctness of the captions generated

References

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2. R. Kiros, R. S. Zemel, and R. Salakhutdinov. Multimodal neural language models. ICML, 2014.
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4. A. Krizhevsky, I. Sutskever, and G. E. Hinton. Imagenet classification with deep convolutional neural networks. In NIPS, 2012.

Thank you