Aishwarya Agrawal

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Education

- **Virginia Tech, Blacksburg, VA, USA** August 2014 - Present
  Ph.D., Computer Engineering
  GPA: 4.0/4.0, Advisor: Dhruv Batra
- **Indian Institute of Technology (IIT) Gandhinagar, India** May 2014
  Bachelor of Technology, Electrical Engineering; Minor, Computer Science and Engineering
  GPA: 9.42/10, B.Tech Project Advisor: Shanmuganathan Raman

Publications

- **A. Agrawal***, J. Lu*, S. Antol*, M. Mitchell, C. L. Zitnick, D. Parikh and D. Batra. VQA: Visual Question Answering. In Special Issue on *Combined Image and Language Understanding, International Journal of Computer Vision (IJCV)*, 2016.
- **A. Agrawal**, D. Batra and D. Parikh. Analyzing the Behavior of Visual Question Answering Models. In *Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2016.
- C. L. Zitnick, **A. Agrawal**, S. Antol, M. Mitchell, D. Batra and D. Parikh. Measuring Machine Intelligence Through Visual Question Answering. In *AI Magazine*, 2016.
- G. Christie*, A. Laddha*, **A. Agrawal**, S. Antol, Y. Goyal, K. Kochersberger and D. Batra. Resolving Language and Vision Ambiguities Together: Joint Segmentation & Prepositional Attachment Resolution in Captioned Scenes. In *Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2016.
- T. Huang, F. Ferraro, N. Mostafazadeh, I. Misra, **A. Agrawal**, J. Devlin, R. Girshick, X. He, P. Kohli, D. Batra, C.L. Zitnick, D. Parikh, L. Vanderwende, M. Galley and M. Mitchell. Visual Storytelling. In *North American Chapter of the Association for Computational Linguistics (NAACL)*, 2016.
- S. Antol*, **A. Agrawal***, J. Lu, M. Mitchell, D. Batra, C. L. Zitnick and D. Parikh. VQA: Visual Question Answering. In *International Conference on Computer Vision (ICCV)*, 2015.
- **A. Agrawal** and S. Raman. A Novel LBP Based Operator for Tone Mapping HDR Images. In *International Conference on Signal Processing and Communications (SPCOM-2014) and IEEE Xplore*, 2014.
- R. Das, **A. Agrawal**, M. Upton and E.J. Seibel. Optically clearing tissue as an initial step for 3D imaging of core biopsies to diagnose pancreatic cancer. In *SPIE BiOS*, pp. 89410N-89410N. International Society for Optics and Photonics, 2014.

Talks

- Analyzing the Behavior of Deep Visual Question Answering Models. *Deep Learning Summer School*, 2016. Montreal, Canada. [Video]
- Overview of challenge, winner announcements, analysis of results. *VQA Challenge Workshop* (http://www.visualqa.org/workshop.html), CVPR 2016. Las Vegas, USA. [Video]
- VQA: Visual Question Answering. *GPU Technology Conference (GTC)*, 2016. San Jose, USA. [Video]

Projects

Analyzing the Behavior of Visual Question Answering Models Spring 2016
Advisors: Dhruv Batra, Devi Parikh Virginia Tech

- We developed novel techniques to analyze the behavior of visual question answering models as a first step towards recognizing their strengths and weaknesses, and identifying the most fruitful directions for progress.

- We analyzed the best performing models from two major classes of VQA models – with-attention and without-attention and showed the similarities and differences in the behavior of these models. We also analyzed the winning entry of the VQA Challenge 2016.
- Our behavior analysis revealed that despite recent progress, today's VQA models are "myopic" (tend to fail on sufficiently novel instances), often "jump to conclusions" (converge on a predicted answer after 'listening' to just half the question), and are "stubborn" (do not change their answers across images).

VQA: Visual Question Answering Spring 2015
Advisors: Margaret Mitchell, Dhruv Batra, C. Lawrence Zitnick, Devi Parikh Virginia Tech

- We proposed the task of *free-form* and *open-ended* Visual Question Answering (VQA). Given an image and a natural language question about the image, the task is to provide an accurate natural language answer.
- We provided a dataset containing ∼0.25M images, ∼0.76M questions, and ∼10M answers (www.visualqa.org), and discussed the information it provides.
- We developed a deep neural network for VQA and implemented several baseline models.

Holistic Scene Understanding via Multiple Structured Hypotheses from Perception Modules Fall 2014
Advisor: Dhruv Batra Virginia Tech

- We proposed a novel approach for holistic reasoning about multiple sub-modules of perception such as semantic segmentation, sentence parsings, 3D layout, etc.
- In particular, we showed significant improvements in the accuracy of prepositional phrase attachment resolution compared to the accuracy of Stanford Parser's 1-best parse when jointly reasoned with semantic segmentations of the associated images for consistency.

Tone mapping HDR images using LBPs Fall 2013
Advisor: Shanmuganathan Raman IIT Gandhinagar

- We proposed two operators that successfully tone map High Dynamic Range (HDR) images using contrast measures derived from Local Binary Patterns (LBPs).
- We showed that the proposed operators are comparable to ten existing operators in terms of execution time while being computationally simpler and requiring only two input parameters.

Shape recovery using Photometric Stereo Fall 2013
Advisor: Shanmuganathan Raman IIT Gandhinagar

- Implemented the algorithm of four harmonics in the paper "Photometric Stereo with General, Unknown Lighting", by R. Basri, D. Jacobs, I. Kemelmacher, 2006.
- Recovered albedos and surface normals by 4D approximation of image space of scene in C++ using OpenCV.

Research Internships

Microsoft Research, Redmond (Mentor: C. Lawrence Zitnick) Summer 2015

- Played an active role in releasing the VQA dataset to the public. Developed and released the VQA API and evaluation code (https://github.com/VT-vision-lab/VQA).
- Implemented Deep Structured Semantic Model (DSSM) based initial approaches to solve VQA.
- Trained and tested DSSM models for image sequences and stories, for an ongoing project (Visual Storytelling) at MSR.

University of Washington, Seattle (Mentor: Eric Seibel) Summer 2013

- Conducted an investigation comparing degree of optical clearance in pancreatic tissue using glycerol and FocusClear against formalin control.
- Implemented filtered backprojection algorithm for 3D reconstruction of OPTM images using MATLAB and VolView.

IIT Gandhinagar (Mentor: Ragavan K.) Summer 2012

- Programmed FPGA in Verilog to generate firing pulses for SCRs of the rectifier for open loop speed control of DC motor.
- Developed Verilog code for automatic regulation of SCR's firing angle for closed loop speed control of DC motor.

Professional and Academic Activities

- Lead Organizer, VQA Challege Workshop @ CVPR 2016 and CVPR 2017
- Lead Organizer, VQA Challenge 2016 and 2017
- Reviewer for CVPR 2016, ECCV 2016, ICLR 2017, CVPR 2017
- Graduate Teaching Assistant (Virginia Tech) Fall 2014, Spring 2015
  Course: Introduction to Data Structures and Algorithms
- Teaching Assistant (IIT Gandhinagar) Fall 2013
  Course: Computing (Python and C)

Honors and Awards

- Finalist, Microsoft Research PhD Fellowship 2017
- Finalist, Adobe Research PhD Fellowship 2017
  (Acceptance rate less than 10%, over 100 applicants)
- Registration fee waiver, Deep Learning Summer School, Montreal 2016
  (235 of 775 applicants accepted for participation in the summer school)
- Best Poster award, Object Understanding for Interaction Workshop, ICCV 2015
- Travel award, Women in Computer Vision Workshop, CVPR 2015
- Scholarship for academic excellence, IIT Gandhinagar 2011, 2012
  (Awarded to branch topper – 1 out of 45 students)
- Dean's List for academic excellence, IIT Gandhinagar 2011, 2012, 2013, 2014

Coursework

- **Graduate Coursework**: Computer Vision, Numerical Analysis and Software, Introduction to Machine Learning, Introduction to Artificial Intelligence, Deep Learning for Perception, Advanced Computer Vision, Data Analytics
- **Undergraduate Coursework**: 3D Computer Vision, Digital Image Processing, Fundamentals of Artificial Neural Networks, Algorithms: Analysis and Design, Markov Chains and Queueing Models, Introduction to Computational Complexity Theory, Discrete Mathematics, Probability and Random Processes, Linear Algebra, Differential Equations, Complex Analysis

Skills

- **Programming Languages**: C, C++, Python, MATLAB
- **Libraries**: Torch, CAFFE
- **Human Computation**: Amazon Mechanical Turk

Significant Activities

- Captain, Women's Badminton Team, IIT Gandhinagar 2012-2013
- Joint-Organizer, Badminton Tournament, IIT Gandhinagar Sports Festival March 2012
- Runners up, Mechanical Model Competition, IIT Gandhinagar March 2011