

## EDUCATION

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- **Georgia Institute of Technology** Atlanta, GA  
*Master of Science in Computer Science; Advised by Dr. Devi Parikh* Aug. 2017
- **Delhi Technological University (DTU)** Delhi, India  
*Bachelor of Technology in Electrical Engineering; GPA: 4.00* Aug. 2012 – Dec. 2016

## RESEARCH INTERESTS

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Computer Vision, Machine Learning, AI, Interpretability in Deep Networks, Human-AI Collaboration

## PUBLICATIONS

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- **Choose Your Neuron: Incorporating Domain Knowledge Through Neuron-Importance**  
*Submitted to IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2018*  
R. Selvaraju\*, **P. Chattopadhyay\***, M. Elhoseiny, T. Sharma, D. Batra, D. Parikh, S. Lee
- **Do Explanations make VQA models more Legible?**  
*Submitted to IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2018*  
A. Chandrasekaran\*, D.Yadav\*, **P. Chattopadhyay\*** V. Prabhu\*, D. Parikh
- **Evaluating Visual Conversational Agents via Cooperative Human-AI Games**  
*AAAI Conference on Human Computation and Crowdsourcing (HCOMP) 2017, Oral*  
**P.Chattopadhyay\***, D.Yadav\*, V. Prabhu, A. Chandrasekaran, A. Das, S. Lee, D. Batra, D. Parikh
- **It Takes Two to Tango: Towards Theory of AI's Mind**  
*Chalearn Looking at People Workshop, CVPR 2017 - Explainable Computer Vision Track*  
A. Chandrasekaran\*, D.Yadav\*, **P. Chattopadhyay\*** V. Prabhu\*, D. Parikh
- **Counting Everyday Objects in Everyday Scenes**  
*IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2017, Spotlight*  
**P.Chattopadhyay\***, R.Vedantam\*, R. Selvaraju, D. Batra, D. Parikh
- **Delhi Technological University: Design and Development of the Littoral AUV Zyra 2.0**  
*AUVSI RoboSub Journal 2014, Journal*

## RELEVANT COURSEWORK

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- **Machine Learning Theory (CS-7545)**: Taught by Dr. Jacob Abernethy, GaTech
- **Deep Learning (CS-7643)**: Taught by Dr. Dhruv Batra, GaTech
- **Advanced Analog Circuit Design**: Taught by Dr. Pragati Kumar, DTU
- **Network Analysis and Control Systems**: Taught by Dr. Madhusudhan Singh, DTU
- **Microprocessors**: Taught by Dr. Vishal Verma, DTU

## EXPERIENCE

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- **Computer Vision Lab, Georgia Tech** Atlanta, GA  
*Research Assistant, mentored by Dr. Devi Parikh and Dr. Dhruv Batra* Fall 2017 - Current  
Working on problems at the intersection of computer vision and natural language processing with a focus towards building intelligent and interpretable systems and subsequently studying their behavior in the context of human-AI interaction.
- **CVMLP Lab, Virginia Tech** Blacksburg, VA  
*Research Assistant, mentored by Dr. Devi Parikh and Dr. Dhruv Batra* Jun 2015 - May 2017  
Worked on scene-understanding problems such as object detection and counting in everyday scenes with a downstream focus towards visual question answering.

- Robotics Research Lab, IIIT Hyderabad** Hyderabad, India  
*Research Intern, mentored by Dr. K Madhava Krihsna* *Dec 2014 - Jan 2015*  
 Implemented an efficient strategy for a robot to discover, recognize and navigate to a selected few objects among some scattered in an environment, based on a - guess from far and recognize from near - strategy.
- Indian Association for the Cultivation of Science, Kolkata** Kolkata, India  
*Research Intern, mentored by Dr. Soumitra Sengupta* *Jun 2014 - Aug 2014*  
 Worked on finding Charged Rotating Black Hole solutions in Einstein-Gauss-Bonnet dilaton coupled gravity and simulated the conditions for the existence of multiple horizons in constant scalar curvature  $f(R)$  gravity.
- Autonomous Underwater Vehicle Team, DTU** New Delhi, India  
*Undergraduate Researcher, mentored by Dr. R K Sinha* *Aug 2012 - Aug 2016*
  - Underwater Acoustics:** Developed and implemented range estimation algorithms for Passive Source Localization from Time Difference of Arrival (TDOA) values in conjunction with machine vision techniques.
  - Control Systems:** Designed control modules of the AUV. Implemented simultaneous PID loops to maintain the orientation of the AUV in motion.

## SELECTED PROJECTS

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- Incorporating Domain Knowledge in Neurons:** We introduce a simple, highly efficient zero-shot learning approach that learns to map domain knowledge about novel classes onto the neurons in a deep network by solving for network parameters which can effectively combine ‘concepts’ learned by neurons - essentially learning novel deep classifiers. Inverting these mappings allows us to provide visual and textual explanations for predictions made by the newly learned classifiers for unseen classes.
- Evaluating Visual Conversational Agents:** We designed a cooperative ‘image-guessing’ game - GuessWhich - to evaluate state-of-the-art visual conversational agents by pairing them with humans under a dialog-based image retrieval setting. Our human studies suggest a counter-intuitive trend - that while AI literature shows that while RL finetuned chatbot teams perform better compared to chatbots trained in a supervised fashion for this task; this improvement in performance does not translate to human-AI teams suggesting a potential disconnect between benchmarking of AI in isolation and in the context of human-AI teams.
- Theory of AI’s Mind:** We argue that for human-AI teams to be effective, humans must also develop a theory of AI’s mind (ToAIM) - get to know its strengths, weaknesses, beliefs, and quirks. Instantiating these ideas within the domain of Visual Question Answering (VQA), we find that using just a few examples (50), lay people can be trained to better predict responses and oncoming failures of a complex VQA model. We further evaluate the role existing explanation (or interpretability) modalities play in helping humans build ToAIM. Our results indicate that existing explanation modalities do not make VQA models more *legible*.
- EvalAI:** We designed an open source platform to help researchers, students and data scientists to host and participate in AI challenges. By simplifying and standardizing the process of benchmarking AI, EvalAI aims to circumvent many of the factors impeding the rate of progress in AI such as - standardized evaluation protocols, faster evaluation, etc. Supported by CloudCV, EvalAI hosted the VQA Challenge at CVPR’17 with a 6x speedup in evaluation compared to the previous iteration of the challenge on CodaLab. Researchers from a number of organizations have shown interest in hosting their AI Challenges on EvalAI in the near future. Some of these organizations are: Facebook AI Research, Google Research, Stanford University, Georgia Tech, etc.
- Counting in Everyday Scenes:** We build dedicated models for counting designed to tackle the large variance in counts, appearances, and scales of objects found in natural scenes. Our approach is inspired by the phenomenon of subitizing - the ability of humans to make quick assessments of counts given a perceptual signal, for small count values. Given a natural scene, we employ a divide and conquer strategy while incorporating context across the scene to adapt the subitizing idea to counting.

## PROGRAMMING SKILLS

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- Languages:** C++, Python, Matlab, Lua, L<sup>A</sup>T<sub>E</sub>X, Shell
- Frameworks:** Caffe, Torch/PyTorch, Keras, Tensorflow, ROS, PCL, OpenCV, Qt

## ACHEIVEMENTS

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- **Winner:** VT-Hacks, 2017, a Major League Hacking event.
- **Semi-Finalists:** ROBOSUB - AUVSI, 2013
- **Finalists:** NIOT SAVe, 2013
- **Awarded:** Merit Scholarships for Academic Performance (2012-2014)
- **Selected:** KVPY and INSPIRE Fellowships, 2012
- **National Top 1 Percent:** Indian National Physics Olympiad (InPhO), 2013