Aravindh Mahendran

Contact Information

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Objective

Develop and analyze machine learning methods for understanding visual information.

Research Interests

Machine learning, Deep learning, Computer Vision, Cognitive Science

Educational Record

D. Phil in Engineering Science, Dept. of Engineering Science — Oct. 14 - Dec. 18 (Expected)
University of Oxford, Oxford, United Kingdom — *Advisor: Prof. Andrea Vedaldi*

Master of Science in Robotics, Robotics Institute — Aug. 12 - Dec. 13
Carnegie Mellon University, Pittsburgh, PA, USA — GPA: 4.11/4.33

Bachelor of Technology (Honors) Computer Science and Engineering — Aug. 08 - Jun. 12
International Institute of Information Technology Hyderabad, India — GPA: 9.81/10

Publications

Aravindh Mahendran, James Thewlis, Andrea Vedaldi **"Cross Pixel Optical Flow Similarity for Self-Supervised Learning"**, Asian Conference on Computer Vision (ACCV 2018). **[Oral with acceptance rate 4.6%]**

Aravindh Mahendran, Andrea Vedaldi **"Visualizing Deep Convolutional Neural Networks Using Natural Pre-images"**, International Journal of Computer Vision (IJCV 2016), Issue 3, Volume 120, Pages 233-255.

Aravindh Mahendran, Andrea Vedaldi **"Understanding Deep Image Representations by Inverting Them"** IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2015). **[Oral with acceptance rate 3.3%]**

Aravindh Mahendran, Andrea Vedaldi **"Salient Deconvolutional Networks"**, European Conference on Computer Vision (ECCV 2016).

Aravindh Mahendran, Martial Hebert, Stephen Smith **"Exploiting domain constraints for exemplar based bus detection for traffic scheduling"** IEEE 17th International Conference on Intelligent Transportation Systems (ITSC 2014).

Ayush Dewan, Aravindh Mahendran, Nikhil Soni, K. Madhava Krishna **"Heterogeneous UGV-MAV Exploration Using Integer Programming"** IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2013).

Ayush Dewan, Aravindh Mahendran, Nikhil Soni, K. Madhava Krishna **"Optimization Based Coordinated UGV-MAV Exploration for 2D Augmented Mapping"** Extended abstract at Twelfth International Conference on Autonomous Agents and Multiagent Systems(AAMAS 2013).

Aravindh Mahendran, Ayush Dewan, Nikhil Soni, K. Madhava Krishna **"UGV-MAV Collaboration for Augmented 2D Maps"** Advances in Robotics - International Conference of Robotics Society of India (AIR 2013).

Academic Achievements

- Joint Institute Gold Medalist for the batch of 2008 - IIIT Hyderabad.
- Among 35 students nationwide to clear the Indian National Mathematics Olympiad (2007).
- Best Presentation Prize at International Computer Vision Summer School (ICVSS), Sicily, 2015.

Talks and Posters

Understanding Deep Image Representations by Inverting Them

- Poster and presentation at ICVSS, Sicily — July 2015
- Seminar at the Computer Vision and Information Technology group, International Institute of Information Technology (IIIT), Hyderabad — Dec. 2015

Ensemble of Exemplar SVM - Convex Relaxation of Latent SVM
Poster and spotlight at the International Workshop on Large Scale Visual Recognition and Retrieval, Part of CVPR 2014 June 2014

Work Experience

Research Assistant, Carnegie Mellon University Jan - June 2014
Advisor: Prof. Abhinav Gupta (Robotics Institute, CMU)
Predictive modeling as an unsupervised learning strategy for deep convolutional neural networks.

Exchange Visitor, Viterbi India Program, Univ. of Southern California May - July 2011
Advisors: Prof. Guarav Sukhatme, Prof. Maja Matarić (University of Southern California)
Registration of point clouds obtained from different Microsoft Kinects. Experimented with calibration target and feature matching based approaches. Proposed a novel plane matching approach that utilized an error metric based on both depth and color information.

Academic Services

Reviewer
Computer Vision and Pattern Recognition (CVPR) 2018, European Computer Vision Conference (ECCV) 2016, International Journal of Computer Vision (IJCV), IEEE Transactions on Pattern Recognition and Machine Intelligence (PAMI), IEEE Transactions on Neural Networks and Learning Systems (NNLS).

Teaching

- Teaching Assistant (Grader) for undergraduate course on Artificial Intelligence (Spring 2011 at IIIT Hyderabad)
- Lab demonstrator for B-16 Software Programming lab (Hillary Term 2015, University of Oxford)
- Guest Lecture on Neural Networks for 3YP (Third Year Project Undergraduate Class - Hillary Term 2016, 2017, University of Oxford).

Academic and Research Projects

Understanding Deep Image Representations by Inverting Them Oct. 2014 - 2016
Advisor: Prof. Andrea Vedaldi (University of Oxford)
Experimented with inverting deep CNN representations by solving a per-image optimization problem, regularized by a natural image priors to improve interpretability of the result (CVPR 2015). Our results try to answer the question, "What image does this feature represent?". We generalized the formulation to include neuron maximization and activation enhancement (IJCV 2016). Source codes released on Github - `https://github.com/aravindhm`.

Bus Detection in Traffic Video Jan. 2013 - Dec. 2013
Advisors: Prof. Stephen Smith, Prof. Martial Hebert (Robotics Institute, CMU)
Experimented with Exemplar SVMs for bus detection in traffic video data. Used Extreme value theory based calibration and search space pruning using domain knowledge to significantly improve detection speed and accuracy. Achieved 0.84 average precision for bus detection on a dataset built for our application of adaptive traffic scheduling. This project resulted in a paper at ITSC 2014.

Exemplar SVM theory Jan. 2013 - May 2013
Advisors: Prof. Larry Wasserman (Dept. of Statistics, CMU), Prof. Aarti Singh (ML Dept., CMU)
Formulated the ensemble of exemplar SVM as a convex relaxation of an empirical risk minimization (ERM) objective. This ERM objective is essentially Felzenszwalb's Deformable parts model without parts and with a large number of mixture components.

Collaborative UGV, MAV exploration Aug. 2011 - May. 2012
Advisor: Prof. Madhava Krishna (Robotics Research Center, IIIT Hyderabad)
Developed an integer program to decide the next best position for a team of UGVs and MAVs for optimal exploration incorporating real world limitations of these agents. Integer program based exploration achieved 10-15% reduction in average distance traveled by agents when compared to an incremental frontier allocation method. These results were presented at IROS 2013, extended abstract AAMAS 2013 and AIR 2013.

Other Projects

Engineering Systems course project: Led a team of 26 members to work towards a set of policies for mitigation, preparedness and response to earthquake disasters in India.

Select Courses Machine learning, Statistical Machine Learning, Computer vision, Statistical Methods in Artificial Intelligence, Optimization Methods, Linear algebra, Introduction to Cognitive Science.

Computer Skills

- *Operating systems:* GNU/Linux, Windows
- *Programming Languages:* C, C++, Python
- *Tools/Frameworks:* Tensorflow; Experience in MatConvNet, LuaTorch, Caffe.

Extra-Curricular Activities

Teach Green - Secretary and volunteer for student run project on environmental education for primary school students.
`http://oxfordteachgreen.weebly.com/` Oct. 2014 - May 2017

Yoga Classes - Coordinated between four common rooms and the yoga instructor to organize joint weekly yoga classes at New College, University of Oxford. Jan. 2016 - July 2017