Akshat Dave

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RESEARCH INTERESTS

Deep Learning, Generative Models, Low-level Vision, Artificial Perception, Computational Photography

EDUCATION

Program	Institution	%/CGPA	Completion
B.Tech & M.Tech, Electrical Eng. (Minor in System Eng.)	Indian Institute of Technology Madras, Chennai, India	**8.74**/10	2017
Semester Exchange (7th semester)	KTH Royal Institute of Technology, Stockholm, Sweden	**9.00**/10	2015
XII(CBSE)	SGS AMNEM School, Indore	**94.60** %	2012
X(CBSE)	St. Paul's H. S. School, Indore	**9.80**/10	2010

SCHOLASTIC ACHIEVEMENTS

- Master's thesis proposal awarded *Qualcomm Innovation Fellowship 2016* which provides **1 million INR** funding to the research lab and full mentorship by **Qualcomm Research**
- Recipient of *Svaagata*, an Erasmus Mundus Scholarship of **1000 euros** per month for **Semester Exchange** in Europe. Completed my seventh semester at *KTH Royal Institute of Technology, Stockholm, Sweden*
- Secured All India Rank **845** in IIT-JEE 2012 amongst **0.48 million** participants
- Secured All India Rank **212** in AIEEE 2012 amongst **1.1 million** participants
- Recipient of Kishore Vaigyanik Protsahan Yojana (KVPY) **National Fellowship** for Basic Sciences in 2011, awarded by *Department of Science and Technology, Government of India*
- Secured All India Rank **17** in National Cyber Olympiad (NCO), 2010 and **13** in National Science Talent Search Examination (NSTSE), 2010

RESEARCH PUBLICATIONS

- **Akshat Dave**, Anil Kumar Vadathya, Kaushik Mitra, "Compressive Image Recovery Using Recurrent Generative Model", *submitted to Computer Vision and Pattern Recognition (CVPR) 2017* (arXiv)
- **Akshat Dave**, Anil Kumar Vadathya, Kaushik Mitra, "Deep Generative Networks For Image Processing", *Workshop by Interdisciplinary Lab on Data Sciences (ILDS), IIT Madras 2016* (poster)
- Akshay K. Gulati, Shubham Chavan, **Akshat Dave**, et al., "IITMSAT Communications System - A LeanSat Design Approach", *3rd IAA Conference on University Satellites Missions & CubeSat Workshop 2015* (paper)

RELEVANT COURSEWORK

- **Data Science and Pattern Analysis :**
  Machine Learning, Reinforcement Learning[1], Data Mining, Multivariate Data Analysis, Kernel Methods for Pattern Analysis, Complex Network Analysis
- **Artificial vision and perception :**
  Computer Vision and Image Analysis, Image Signal Processing, Computational Photography[2]
- **Mathematical Foundations :**
  Calculus I Functions of One Variable, Calculus II Functions of Several Variables, Probability Statistics and Stochastic Processes, Complex Variables and Transformation Techniques, Process Optimization

[1] Course to be done next semester
[2] Ongoing course

RESEARCH PROJECTS AND INTERNSHIPS

- **Master's Thesis: Deep Recurrent Generative Networks** *May 2016 - till date*

  Guide: Dr. Kaushik Mitra

  - Proposed a novel technique to apply deep learning based **generative models** for solving different problems in the field of image processing, compressive image sensing and computational photography
  - **Tractable** and **scalable** modelling of natural image statistics using **recurrent** neural networks
  - Long short-term memory (**LSTM**) units used to capture long term dependencies in visual data
  - **Versatile** visual priors are learned, which can be directly applied to solve various **image recovery** tasks such as denoising, deblurring, inpainting etc using maximum-a-posteriori principle

- **Generative Colorization of Grayscale Images** *Oct 2016 - till date*
  - Implemented the current state-of-the-art discriminative model for colorization in **Torch**
  - Deep convolutional generative adversarial network used to model **conditional probability distribution** of the colorized image given the grayscale image and latent vector.
  - Introduced **novel** architecture to incorporate stochasticity in the output
  - **Generative model** has the ability to produce different plausible colorizations for the same input

- **Summer School on Deep Learning for Computer Vision** *Jul 2016*
  - Participated in a 7 day hands-on workshop organized by Centre for Visual Information Technology (CVIT) at International Institute of Information Technology, Hyderabad
  - Successfully implemented architectures such as CNNs, RNNs, autoencoders etc. in **Torch** framework
  - Analyzed the recent advances in deep learning methods for vision applications

- **Intelligent Traffic Light System using Reinforcement Learning** *Jun 2015 – Jul 2015*
  - Idea, model and simulation presented at Qualcomm Intern IdeaQuest 2015
  - Formulation of traffic light system with known connections as a **multi-agent network**
  - **Q learning** used to optimize car stoppage times by considering different penalty parameters
  - **Simulation** of the model for an ideal grid scenario implemented in python using **pybrain** framework

- **Wireless Indoor Positioning** *Sep 2015 - Jan 2016*

  Guide: Dr. Satyam Dwivedi
  - Application of **distance ranging** DecaWave DW1000 radio transceiver for indoor positioning
  - Analysis of the APIs used in software implementation of the **time-of-flight** based distance ranging
  - Design and implementation of **positioning algorithms** using Matlab

- **Qualcomm Summer Internship** *May 2015 - Jul 2015*
  - Developed an understanding of different **wireless networks** and the IEEE 802.11 WLAN protocol
  - Analyzed and modified the **firmware** for Wi-FI used in Qualcomm mobile chips
  - Designed an **error response framework** which handles errors in host and firmware communication

- **Crowd Detector using Computer Vision** *Dec 2014 -Jan 2015*
  - **Overhead vision** approach to determine the number of persons standing in a specified area
  - **OpenCV** framework used to implement filtering, gradient and threshold algorithms
  - Crowd density visualized by changing the color intensity of LEDs using **Arduino**

- **IIT Madras Student Satellite Project (IITMSAT)** *Dec 2013 - May 2015*
  - An active member of the communications module of the project
  - Created a **flowchart** of operations for the satellite-ground station communication protocols
  - Developed **master code** to encompass the sequential execution of tasks by the on-board transceiver

COURSE PROJECTS

- **Image Enhancement using Near Infrared (NIR) Imaging** *Sep 2016 - Nov 2016*
  Instructor: Dr. Kaushik Mitra Course: Computational Photography
  - **Examined** the variation in scenes captured by NIR and Visible flash using Raspberry Pi camera modules
  - Implemented **dehazing** of visible image through multi-resolution fusion of corresponding NIR image
  - Compared different approaches for **denoising** low light scene utilizing the NIR image for edge information
- **Author Ranking Metrics in a Citation Network** *Mar 2016 - May 2016*
  Instructor: Dr. Venkatesh Ramaiyan Course: Complex Network Analysis
  - Analyzed **co-authorship** and **co-citation** based network metrics for ranking research paper authors
  - Evaluated the metrics for real world database of scholars from DBLP using **networkx** python package
  - Compared the **effectiveness** of each metric in citation networks with different arrangments

SKILLS

- **Programming Languages :** C, C++, Python, Matlab, Lua, R
- **ML and CV Frameworks :** Caffe, Torch, Tensorflow, pylearn2, scikit-learn, scikit-image, opencv
- **Design Tools :** Adobe Photoshop, Illustrator, Light room, After Effects, Autodesk 3DS Max

POSITIONS OF RESPONSIBILITY

- **Teaching Assistant**, IIT Madras *Aug 2016 - till date*
  - Teaching assistant for the course: Data Structures and Algorithms
  - Evaluated assignments, invigilated examinations and helped students with their doubts
  - Continuing the assistantship next semester for the course: Machine Learning for Computer Vision
- **Core Team Member**, Concept and Design, Shaastra[3] 2015 *Jun 2014 - Jan 2015*
  - Nominated by the Dean of Students to **train and lead 45 students** across 4 teams
  - Responsible for the fest's **aesthetic appeal** through social media, ambience, merchandise and photography
  - Introduced **techno-ambiance** : a unique fusion of art and technology through interactive outdoor models
  - Increased the fest's social media presence **3 times** compared to the previous years
- **Hostel Head Volunteer** for literary activities *Aug 2013 - May 2014*
- **Graphic Design Coordinator**, Shaastra[3] 2014 and Saarang[4] 2014 *Aug 2013 - Dec 2013*
- **Alumni Telethon Coordinator**, International and Alumni Relations team *Aug 2013 - Dec 2013*

EXTRA-CURRICULAR ACTIVITIES

- **Graphic Design**
  - Worked as a freelancer for 99designs.com and Sheermedia
  - Designed the winning entry for Creative Writing, Lit-Soc[5] 2015
- **Photography**
  - Manager of the Chennai Photowalkers club
- **Squash**
  - Hostel team member for Schroeter[6] 2013

[3] Shaastra is IIT Madras' annual technical fest
[4] Saarang is IIT Madras' annual cultural fest
[5] Lit-Soc is IIT Madras' inter-hostel literary and cultural competition
[6] Schroeter is IIT Madras' inter-hostel sports competition