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Karttikeya Mangalam

Senior Undergraduate, Computer Science and Electrical Engineering, IIT Kanpur

Education

Indian Institute of Technology Kanpur, Uttar Pradesh, India
Double Major in Electrical and Computer Science and Engineering *Jul' 14 - Jul' 19 (Expected)*
GPA: 9.4/10 (6 Semesters)

Ecole Polytechnique Fdrale de Lausanne , Lausaane, Switzerland
Semester Exchange in Computer Science *Sept'17 - Feb' 18 (Expected)*
Ongoing

Research Interests

Machine Learning, Computer Vision, Image Processing, Deep Learning

Publications

Karttikeya Mangalam, K S Venkatesh "Bitwise Operations of Cellular Automaton on Gray-scale Images" . *28th Irish Signals and Systems Conference (ISSC'17)* Killarney, Ireland

Awards & Achievements

All-India-Rank 1 in National Science Talent Search Examination-2011 out of 500,000 students

Selected as an **Indian National Mathematical Olympiad Awardee** bestowed to only 30 students nationwide annually *for demonstrating extraordinary talent in pre-college mathematics.*

Received **Summer Undergraduate Research Grant** 2016 for Excellence by IIT Kanpur.
Academic Excellence Award 2015-16 awarded to Top 5% students in IIT Kanpur.

1st State Rank in Regional Mathematics Olympiad-2013 out of 10,000 students.
1st State Rank in 5th SOF International Mathematics Olympiad 2012.
1st State Rank in both First & Second Round of NTSE-2010 out of 30,000 students.
1st State Rank in National Level Science Talent Search Examination -2011)

Top 1 % Nationwide out of 37,000 enrolled in National Standard Examination in Physics.
Top 1% Nationwide in National Standard Examination in Junior Science 2010.
Top 1% Nationwide out of more than a million students in in AISSCE 2014.

99.97 percentile in Joint Entrance Examination (IIT-JEE) 2014 in 1.5 million students.

Recipient of **Honda Young Engineer & Scientists (Y-E-S) Fellowship** 2017 and **10,000$** grant awarded to **14** undergraduates nationally for appreciating their work.
Selected as an **National Talent Search awardee** in 2010 bestowed by MHRD to **500 out of 300,000** students nationwide to identify students with high intellect and academic talent.
Recipient of **Kishore Vaigyanik Protsahan Yojana (KVPY)** Fellowship in 2013 that awarded to **1100 students from 100,000** applicants by the Department of Science and Technology.

Selected among **10 students** for an opportunity of Double Major at IIT Kanpur.
Selected among **2 students** for the opportunity for Semester Exchange at EPFL, Switzerland.

Research Projects

Binary Image Recombination after Bitwise Operations Of Cellular Automaton
SURGE Research Internship, Prof. K S Venkatesh, CV Lab, IIT Kanpur *May '16 - Dec'16*

- Improved the performance of *state of the art image denoising algorithm for Salt & Pepper noise by 5-7 %* with minimal space-time overheads
- Designed an algorithm to extend the use of Cellular Automaton of Image Processing tasks
- Results of the project are published in IISC 2017 & further details are present on homepage

Joint Estimation of Spontaneity and Emotion from speech in Dyadic Conversations
Prof. Tanaya Guha, Multimedia & Signal Processing Lab, IIT Kanpur Jan '17 - September'17

- Proposed a *Novel ML based framework for classifying speech* in 3-way emotion classification by joint estimation of spontaneity or planning of the action.
- Identified spontaneity of speech (planned/scripted or improvised) as a key feature to emotion classification and demonstrated role of context in identification
- Paper on the findings is currently submitted to International Conference on Acoustics, Speech and Signal Processing (ICASSP, 2018).

Future Localization of Pedestrians in First Person View
Summer Internship, Prof. Yoichi Sato, CV Lab, University of Tokyo *May '17 - Present*

- Developed Deep Convolutional RNN Architecture for jointly estimating the position of pedestrians in future in the view of person wearing the camera and ego-motion of the user.
- Collaborated to investigate a number of Pose Estimation, Segmentation, Depth Estimation, Social Interaction Layers and other state of the art networks centered around Human Affective CV.
- Trained and tweaked many different Deep/Shallow Convolutional and sequential architectures .
- Paper is in preparation for submission to CVPR 2018.

Distillation of Neural Net with Residual Connections
Dr. Mathieu Salzamann, CV Lab, EPFL *Oct '17 - Present*

- Literature survey of existing Knowledge Distillation methods with extension to skip connections.
- Planned implementation of U-Net and Stacked Hourglass architecture and experiment with Layer sizes, hint based learning and FitNets.

Industrial Internship & Projects

Hybrid Recommender Systems using feature selection by Markov Blanket
Busigence Technologies, Machine Learning Internship *December 2016*

- Designed a Probabilistic Graphical Model Based procedure to scale down features. using Markov Blankets based IAMB algorithm.
- Devised a hybrid recommender system using Restricted Boltzmann Machine based Collaborative Filtering and applied it on e-commerce and retail domain. Code available on Github page.

Image Processing Subsystem, Varun
Autonomous Underwater Vehicle , Robotics Club, IIT Kanpur *Sept. '14 - Sept. '15*

- Implemented standard image processing algorithms for line following and object detection in OpenCV to develop an AUV capable of maneuvering autonomously underwater.
- Integrated the computer vision system with onboard odroid and turbine actuators for 360 maneuver

Automated Modeling for Course Recommendation (C.R.A.M)
Google DevFest 2016 *October 2016*

-Developed a web-app to recommend next semester courses to IITK students using model trained from alumni career paths and curriculum at IITK.
- **Stood Overall best winner** (application + business plan) amongst more than 50 competing teams

Emotion Recognition from Static Human faces
Course Project, CS771A - Machine Learning, Prof. Piyush Rai *Aug. '16 - Dec. '16*

-Annotated the database for Emotion Recognition in the Wild challenge 2016 using Google Cloud Vision API
- Trained Convolutional Models on Pytorch and benchmarked against state of the art methods.

Solutions To Non-Causal Difference Equations
Prof. KS Venkatesh, CV Lab, IIT Kanpur *Nov.'14 - Dec. '14*

- Designed algorithm for finding solutions to Non-Causal difference equations efficiently.
- Used interpolation to solve the equivalent problem in differential equations and sampled to obtain discrete domain results. Benchmarked with standard linear algebra algorithms in Matlab.

Computer Skills

Languages: Python, R ,C, LaTeX, Java
Packages (DL) : Pytorch, Tensorflow, Chainer, Keras, Theano
Packages (ML) : Scikit-learn, Matlab ML Package, CatBoost

Relevant Coursework

Mathematics: Linear Algebra, Probability and Statistics, Convex Optimization*, Discrete Opimization (Coursera), Calculus - II
Machine Learning: Machine Learning Techniques, Online Learning and Optimization, Machine Learning (Coursera), Neural Networks (Coursera)
Data Science: Applied Data Science*, Machine Learning Programming*, Intelligent Agents*, Image processing I* , A Network Tour Of Data Science*
** indicates ongoing at EPFL*

Other Interests

Community Service : A core team member of Institute's Counseling service, responsible in a team of 10 for organizing six day welcome programmer for the freshmen and the mental well being of the undergraduate students on behalf of IIT Kanpur.
Webmaster of Counselling service website : http://www.iitk.ac.in/counsel/

Machine Learning Hackathons and Kaggle Challenges
Philosophical Debates/Discussions on scientific methods and procedures