

Karttikeya Mangalam

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SENIOR UNDERGRADUATE, ELECTRICAL ENGINEERING, IIT KANPUR

EDUCATION

Indian Institute of Technology Kanpur, India

Major in Electrical Engineering with

Minor in Artificial Intelligence

GPA: 9.4/10 (6 Semesters)

Aug' 14 - Jun' 18 (Expected)

Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

Semester Exchange in Computer Science (One Semester)

Ongoing

Sept'17 - Feb' 18 (Expected)

Paramount Academy, India

All India Senior School Certificate Examination, Class XII

Percentage: 94.6%

May' 12 - Apr' 14

D.A.V. Public School, India

All India Senior School Certificate Examination, Class X

GPA: 10/10

April 2012

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

Karttikeya Mangalam, Tanaya Guha "Using Spontaneity of Speech to Improve Emotion Recognition" Submitted to *IEEE Signal Processing Letters*

Takuma Yagi, **Karttikeya Mangalam**, Ryo Yonetani, Yoichi Sato "First-Person Human Trajectory Prediction" Submitted to *Computer Vision and Pattern Recognition 2018 (CVPR'18)*

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 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 research work
 Selected as a **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 is 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

First-Person Human Trajectory Prediction

Summer Internship, Prof. Yoichi Sato, CV Lab, University of Tokyo *May '17 - Nov'17*

- Developed Deep Multi-stream Convolution-Deconvolution Architecture for estimating the position of pedestrians in future frames from a first person recorded video
- Incorporated several key observations as salient features to improve performance such as perceived visual scale of humans, ego-motion of the camera wearer and human pose information for pedestrians
- 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 and collaborated to record and propose a net dataset for first person vision research in path prediction.
- Paper is currently submitted to Computer Vision and Pattern Recognition (CVPR) 2018

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 *Median filtering algorithm for Salt & Pepper noise* by 5-7 % with minimal space-time overheads using cellular automaton
- Designed a novel 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 - Nov'17*

- Proposed a *Novel SVM 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 for review to the journal Signal Processing Letters

Distillation of Neural Net with Residual Connections (U-Net)

Dr. Mathieu Salzmann, CV Lab, EPFL *Oct '17 - Present*

- Implemented U-net architecture and distillation code in Pytorch
- Trained a number of different models with varying channel layer depth and softmax temperature
- Implemented distillation code (Pytorch) and successfully demonstrated the application of distillation procedure to architecture with residual connections

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 select features using an improved Incremental Association Markov Blanket (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, L^AT_EX, 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 Optimization (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 programme for the freshmen and the mental well being of the undergraduate student batch of 2015 on behalf of IIT Kanpur

Webmaster of Counselling service website : <http://www.iitk.ac.in/counsel/>

Machine Learning Hackathons and Kaggle Challenges

Philosophical debates and discussions on scientific methods and procedures, Nihilism, Atheism and Logical Positivism.