

Karttikeya Mangalam

SENIOR UNDERGRADUATE, ELECTRICAL ENGINEERING, IIT KANPUR

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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, Muzaffarpur, India

All India Senior School Certificate Examination, Class XII

Percentage: 94.6%

May' 12 - Apr' 14

D.A.V. Public School, Muzaffarpur, India

All India Senior School Certificate Examination, Class X

GPA: 10/10

April 2012

RESEARCH INTERESTS

Computer Vision, Deep Learning, Machine Learning, Image Processing

PUBLICATIONS

Karttikeya Mangalam, K S Venkatesh “Bitwise Operations of Cellular Automaton on Gray-scale Images” Published at *28th Irish Signals and Systems Conference (ISSC'17)*, 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**, awarded to only 30 students nationwide annually ‘for demonstrating extraordinary talent in pre-college mathematics’

Received **Summer Undergraduate Research Grant** for Excellence, 2016 by IIT Kanpur

Received **Academic Excellence Award**, 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 among 1.5 million students

Recipient of **Honda Young Engineer & Scientist's (Y-E-S) Fellowship** 2017, awarded to 14 undergraduates nationally *for appreciating their excellent undergraduate research work*
Received a granted of **\$10,000** through the YES+ program for summer research internship

Selected as a National Talent Search awardee in 2010 bestowed by MHRD to **500 among over 300,000** students nationwide *to identify students with high intellect and academic talent*

RESEARCH PROJECTS

ALL RESEARCH PAPERS
ARE UPLOADED
ON THE
HOMEPAGE/ARXIV

First-Person Human Trajectory Prediction

Summer Internship, Prof. Yoichi Sato, CV Lab, University of Tokyo

May '17 - Nov'17

- In collaboration with a master's student, developed *Deep Multi-stream Convolution-Deconvolution Architecture* for estimating future pedestrians' positions in a first person viewpoint 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
- Investigated a number of state of the art Pose Estimation, Segmentation, Depth Estimation, Social Interaction Modeling and Path prediction techniques centered around Human Affective CV
- Tweaked and tested various Deep Convolutional and sequential architectures
- Collaborated to *record and benchmark a new dataset* for locomotion research in first person vision
- Results are 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 - May'17

- Designed a novel algorithm to extend the use of Cellular Automaton of Image Processing tasks
- Improved upon the performance of *Median filtering algorithm* on denoising **Salt & Pepper noise by 5-7 %** with minimal space-time overheads using the proposed algorithm
- Results of the project are published in **Irish Signals and System Conference 2017**, Ireland.

Learning Spontaneity to Improve Emotion Recognition in Speech

Prof. Tanaya Guha, Multimedia & Signal Processing Lab, IIT Kanpur

Jan'17 - Nov'17

- Proposed two different *Multi Task Learning based SVM frameworks* (Hierarchical and Joint) for emotion recognition in speech by estimation of spontaneity and emotional content
- Identified several novel features for the task of spontaneity (planned/scripted or improvised) detection such as context and delta values through feature ablation experiments
- Outperformed the baseline by **12% in positive emotion** identification and by 3% overall
- Paper on the findings is currently submitted for review to the journal **Signal Processing Letters**

Distillation of Fully Convolutional Networks with Residual Connections

Semester Research Project, Dr. Mathieu Salzmann, CV Lab, EPFL

Oct '17 - Present

- Implemented the **U-net architecture** with 2D and 3D convolutional layers in Pytorch
- Tested and compared a number of different models, varying the channel layer depth, softmax temperature, kernel size, architecture depth and optimization parameters.
- Proposed novel distillation methods based on work by Hinton et al. and successfully performed the knowledge transfer to a much **smaller model with just 3% of the original parameters**

INTERNSHIP & OTHER RELEVANT PROJECTS

Generative Visual Manipulation using Manifold learning

EE558 - Network tour of Data Science, EPFL

Sept. '17 - Present

- Devised a pipeline chaining SoTA methods for Manifold learning, sampling along the learned manifold and reconstructing through FCN regressors to generate a 'new' face image using the FERRET dataset
- Improved appearance of the generated image by incorporating a GAN learnt latent space

A COMPLETE LIST OF
PROJECTS
COMPLEMENTED WITH
THE PROJECT REPORTS
AND CODE IS
AVAILABLE ON THE
HOMEPAGE

Prominent Features in Product Advertisements

CS401 - Applied Data Analysis, Prof. Robert West, EPFL

Sept. '17 - Present

- In a team of three, investigated the Amazon Review dataset to identify influential textual and visual features of the product's advertisement that affect consumer reviews
- Employed several statistical hypothesis testing methods aided by CV and NLP techniques
- Developed a 'data story' website to present results : <https://adamazon.github.io/>

Online Recommendation under Log-normal likelihood

CS773A - Online Learning & Optimization, Prof. Purushottam Kar, IITK Jan.'17 - May '17

- Analyzed classical SGD-based matrix completion recommendation approaches like [Jin's algorithm](#)
- Designed an online recommendation scheme under the case of Log-normal likelihood models for a given reward function, as well as it's offline variants for matrix completion

Hybrid Recommender Systems using feature selection by Markov Blanket

Busigence Technologies, Machine Learning Internship

December 2016

- Designed a Probabilistic Graphical Model Based pipeline 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

Emotion Recognition from Static Human faces

CS771A - Machine Learning, Prof. Piyush Rai, IITK

Aug. '16 - Dec. '16

- Employed Google Cloud Vision API for facial feature extraction such as pixel locations of keypoints etc. on Emotion Recognition in the Wild challenge 2016 database
- Trained Convolutional Models using Pytorch and benchmarked against state of the art methods

Automated Modeling for Course Recommendation (C.R.A.M)

Google DevFest 2016

October 2016

- In a team of three, 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

Computer Vision Subsystem, Varun

Autonomous Underwater Vehicle (AUV), Robotics Club, IITK

Sept. '14 - Dec. '15

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

Solutions To Non-Causal Difference Equations

Prof. KS Venkatesh, CV Lab, IITK

Dec. '15 - Jan. '16

- Designed a novel algorithm for finding solutions to Non-Causal difference equations efficiently
- Mapped the discrete problem to an equivalent problem in differential equations and then, sampled in continuous domain to obtain the discrete domain results. Benchmarked with existing algorithms

Magneto, Gesture Controlled Remote Bot

Technical Festival, IIT Bombay

Dec. '15 - Jan. '16

- Designed a bot along capable of picking up and throwing a ball about a distance of two meters
- Fabricated a hand glove capable of detecting a total of 9 gestures using accelerometer and flex sensors for hand movements and finger bents and transmitting them over internet to the bot

COMPUTER SKILLS

Languages: Python, R, C/C++ , Mathematica, MATLAB

Packages(ML): Scikit-learn, Scikit-Multilearn, Weka, Matlab ML Package, CatBoost, XGBoost

Frameworks(CV/DL): OpenCV, Pillow, Pytorch, Tensorflow, Keras, Chainer, Theano

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| RELEVANT COURSEWORK | <p>Mathematics: Linear Algebra, Probability and Statistics, Mathematics of Data* (Stochastic Optimization), Discrete Optimization (Coursera), Calculus - II, Topics in Learning Theory[†]</p> <p>Machine Learning: Machine Learning Techniques, Online Learning and Optimization, Machine Learning (Coursera), Neural Networks (Coursera), Machine Learning Programming*</p> <p>Computer Vision: Visual Recognition**, Computer Vision Techniques**, Image Processing**, Image processing I*, Advanced Image Processing[†], Deep Learning (deeplearning.ai)</p> <p>Data Science: Applied Data Science*, A Network Tour Of Data Science*</p> <p><i>* indicates ongoing at EPFL † indicates to be taken in Spring'18 ** indicates audited at IITK</i></p> |
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| VOLUNTARY WORK | <p>Core Team Operations <i>Counselling Service, IIT Kanpur</i> <i>Jan. '16 - Jan. '17</i></p> <ul style="list-style-type: none"> - In a team of 10, organized a 6-day long Orientation Program on behalf of IIT Kanpur to welcome the batch of 2016 and ensure a smooth transition to college life - Led a team of 137 students guides, to carry out the admission procedures for the new batch such as academic registration, course allotment and biometric affiliation - Organized institute-level remedial sessions aimed at providing help to the academically weak students <p>Webmaster, Counselling Service <i>Counselling Service, IIT Kanpur</i> <i>Jan. '16 - Present</i></p> <ul style="list-style-type: none"> - Developed and maintained Counselling Service's website : http://www.iitk.ac.in/counsel/ - Overhauled the institute's freshman forum; aimed for providing support during admission counselling <p>Academic Mentor <i>Counselling Service, IIT Kanpur</i> <i>Feb. '15 - Jan. '16</i></p> <p>Assisted academically weak students in their freshman year undergraduate courses through institute-level remedial revision lectures and one-on-one doubt clearing sessions</p> <p>Team Leader, Operations <i>Alumni Contact Program, IIT Kanpur</i> <i>Aug. '14 - Feb. '15</i></p> <ul style="list-style-type: none"> - Reached out to alumni for organizing batch re-unions & institute's alumni donation program - Organized over 25 information sessions for aspiring undergraduates from successful alumni in various industry for career guidance and planning |
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| HOBBIES | <p>Machine Learning Hackathons, Kaggle Challenges and various conference challenges such as NIPS 2017 Competition Track - Adversarial Attacks and Defences</p> <p>Philosophical debates and discussions on scientific methods and major canons such as Nihilism, Atheism and Logical Positivism</p> |
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