

Karttikeya Mangalam

MASTERS STUDENT IN COMPUTER SCIENCE

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EDUCATION

Stanford University, California, USA
Masters in Computer Science with Distinction in Research Sept. '18 - May '20 (Expected)

Indian Institute of Technology, Kanpur, India
Major in Electrical Engineering with Minor in Machine Learning Aug. '14 - Jun. '18
GPA: 9.5/10 (Seven Semesters)

Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
Semester Exchange in Computer Science Sept. '17 - Feb. '18
GPA: 5.8/6.0 (One Semester)

Paramount Academy, Muzaffarpur, India
All India Senior School Certificate Examination, Class XII May '12 - Apr. '14
Percentage: 94.6%

D.A.V. Public School, Muzaffarpur, India
All India Senior School Certificate Examination, Class X April 2012
GPA: 10/10

RESEARCH INTERESTS

Computer Vision, Natural Language Processing, Deep Learning

PUBLICATIONS

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

Karttikeya Mangalam, Tanaya Guha "Using Spontaneity of Speech to Improve Emotion Recognition", *International Speech Communication Association - Interspeech 2018* [Oral]

Karttikeya Mangalam, K S Venkatesh "Bitwise Operations of Cellular Automaton on Gray-scale Images", *28th Irish Signals and Systems Conference* (ISSC'17), 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**, 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**, for 3 consecutive years (2015-17) at 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 grant 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*

Recipient of **Kishore Vaigyanik Protsahan Yojana (KVPY)** Fellowship in 2013 , awarded to
 1100 students from 100,000 applicants by the Department of Science and Technology, Govt. of
 India to *encourage excellent students to take up research careers*

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, devised a *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 several state of the art models for 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

Learning Spontaneity to Improve Emotion Recognition in Speech

Prof. Tanaya Guha, Multimedia & Signal Processing Lab, IIT Kanpur Jan. '17 - Mar. '18

- Proposed two different *Multi Task Learning based SVM frameworks* (Hierarchical and Joint) for emotion recognition in speech utilizing the spontaneity information
- Identified several novel features for the task of spontaneity (planned or improvised) detection such as context and delta values through feature ablation experiments on the USC IEMOCAP database
- Paper on the findings is currently submitted for review to the journal **Interspeech 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

Distillation of Fully Convolutional Networks with Residual Connections

Semester Research Project, Dr. Mathieu Salzmann, CV Lab, EPFL Oct. '17 - Feb. '18

- 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**

OTHER RELEVANT PROJECTS

Generative Visual Manipulation using Manifold learning

EE558 - Network tour of Data Science, EPFL Sept. '17 - Feb. '18

- 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

THESE PROJECTS ARE
THE SELECTED BASED
ON RELEVANCE.

AN EXHAUSTIVE LIST
OF PROJECTS ALONG
WITH THE PROJECT
REPORTS AND CODE IS
AVAILABLE ON THE
HOMEPAGE.

Adamazon: Investigating Factors Behind Product Reviews

CS401 - Applied Data Analysis (ADA), Prof. Robert West, EPFL

Sept. '17 - Feb. '18

- 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 its 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
RELEVANT COURSEWORK	Mathematics: Linear Algebra, Probability and Statistics, Mathematics of Data* (Stochastic Optimization) , Convex Optimization Machine Learning: Machine Learning Techniques, Online Learning and Optimization, Machine Learning Programming*, Probabilistic Modeling and Inference Image Processing: Image processing I*, Topics in Image Representation Learning Data Science: Applied Data Analysis*, A Network Tour Of Data Science* <i>* indicates credited at EPFL</i>
VOLUNTARY WORK	Core Team Operations <i>Counselling Service, IIT Kanpur</i> <i>Jan. '16 - Jan. '17</i> <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 Webmaster, Counselling Service <i>Counselling Service, IIT Kanpur</i> <i>Jan. '16 - May '18</i> <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 Academic Mentor <i>Counselling Service, IIT Kanpur</i> <i>Feb. '15 - Jan. '16</i> <ul style="list-style-type: none"> - Assisted academically weak students in their freshman year undergraduate courses through institute-level remedial revision lectures and one-on-one doubt clearing sessions
HOBBIES	Machine Learning Hackathons, Kaggle Challenges and various conference challenges such as NIPS 2017 Competition Track - Adversarial Attacks and Defences Philosophical debates and discussions on scientific methods and major canons such as Nihilism, Atheism and Logical Positivism